

The MINING CONGRESS JOURNAL

Volume 17

FEBRUARY, 1931

No. 2

PRESENTING

Protecting and Regaining Tonnage
Importance of Silver in the Production
of Argentiferous Ores

A Geophysical Survey
on the Santa Rita Ore Body

▲ ▲ ▲

Roof Action in Pillar Recovery
Mechanical Loading on Pitching Seams
Safety as Affected by Supervision and Discipline
Safety—Responsibility of Management

▲ ▲ ▲

Plant and Equipment at Harmony Mines
Accident Prevention Work in the Mines
of the Gogebic Range

▲ ▲ ▲

Coal Convention Plans Mature Rapidly
Mining in Western States in 1930

Contributors

Harry H. Kurtz, Charles W. Merrill, L. H. Henderson, G. B. Southward,
O. G. Sharrer, A. U. Miller, T. G. Fear, Earl F. Nieman, W. H. Carrick





**"Be sure you're right-
then go ahead" - - -**

DANIEL BOONE

In the grim old days of "The dark and bloody ground" when West Virginia, Kentucky and Tennessee were being "settled"—Daniel Boone did more than any other man to protect the settlers against their savage enemies. Brave and skillful fighter though he was, Boone never took unnecessary risks; and pleaded continually with the inexperienced against straying too far from the safety of their block-houses and stockades.

In these same three States today coal mine officials are fighting to prevent their employees from taking unnecessary risks in an industry that is only safe when proper operating procedures are fully established and rigidly enforced. The steadily improving safety rate in a majority of the mines operated constitutes the highest possible reward for these sturdy successors to the leaders of a century ago.

As manufacturers, since the pioneering days, of Safety Fuse for blasting purposes, we suggest a special slogan for those who handle explosives: *"Be sure you're right, before you light the fuse."*



THE ENSIGN-BICKFORD CO.
SIMSBURY CONNECTICUT

Do Not "Short Fuse"
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DECEMBER, 1930

The title page of a new book, "Tipples and Tipple Equipment," is shown above. Presented therein is a complete exposition of RandS installations, covering our engineering, contracting and erecting activities, as well as many specialized coal handling and preparation equipments of RandS Design.

A copy of this book should be had by every mine owner and operator who contemplates the renovation of old structures or completely new ones. Write for a copy today. Ask for Catalog No. 129, "Tipples and Tipple Equipment."

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THE MINING CONGRESS JOURNAL

VOLUME 17

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Practical Operating Men's Department

COAL

*Recent Developments in Mechanical
Loading on Pitching Seams*

*Safety as Affected by Supervision
and Discipline*

Safety—Responsibility of Management

METAL

Plant and Equipment at Harmony Mines
*Accident Prevention Work in the Mines
of the Gogebic Range of Michigan*

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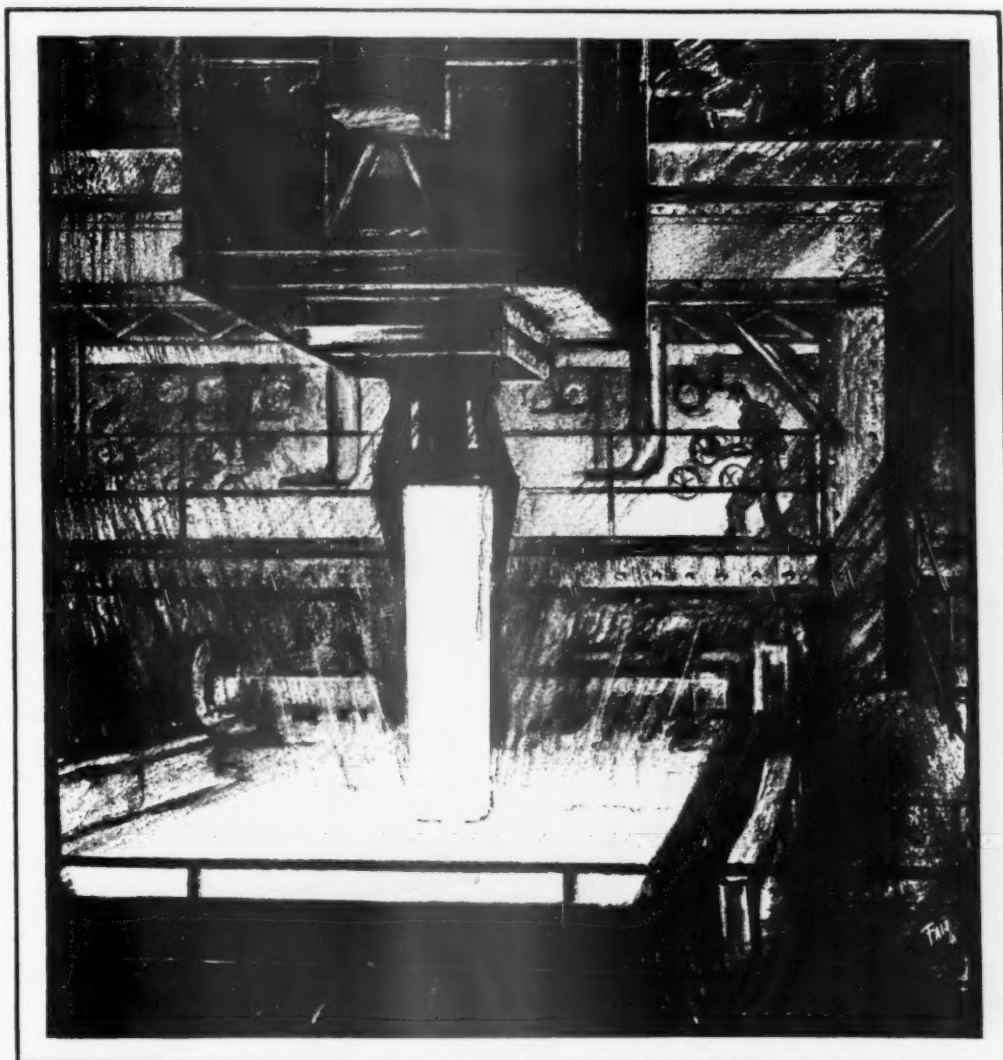
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Down, down . . . into the Soaking Pit

A RED ingot of acid steel from the open-hearth mill. Now it is going into the soaking pit to insure thorough, uniform heating throughout. Then, sparkling white—on through to the blooming mill. Seemingly endless are the operations in the making of Roebling Wire Rope. Each calls for a highly specialized skill and experience. Fine craftsmanship prevails throughout the entire range.

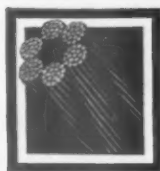
At Roebling the most modern of

manufacturing methods and machinery are daily producing thousands of feet of Roebling "Blue Center" Steel Wire Rope. But tradition plays a part, too. It is old-fashioned thoroughness that guards that extra measure of service for which Roebling Rope is noted.

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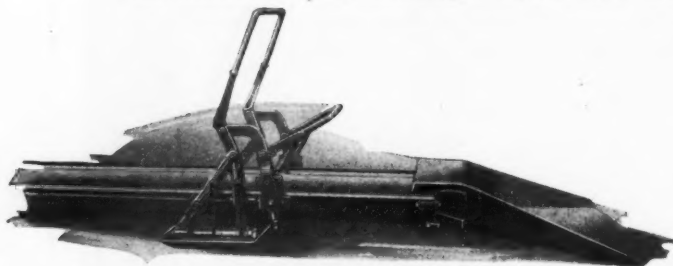


"BLUE CENTER"
STEEL

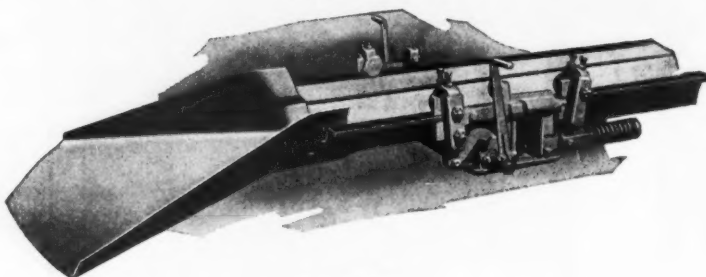
WIRE ROPE

Two Inexpensive Face Loaders

"Duckbill" Loading Head for Shaker Conveyors



High Coal Type



Low Coal Type

Duckbill is a self-loading device for shaker conveyor heads, eliminating hand loading of the conveyor.



Duckbill is designed to fit any substantially built conveyor.

Duckbill is the only loading device which will load coal in any thickness of seam.

Duckbill being of sturdy and rugged build, requires minimum maintenance costs.

Duckbill requires no skilled attendance. Any mine laborer can operate it.

Duckbill makes big savings in time and cost of loading.

"Red Devil" Pit Car Loader

Red Devil not only reduces the cost of loading but increases the percentage of lump as well.

Red Devil is built rugged, to withstand the usual rough mine usage.

Red Devil may be had in many types and sizes. Open or Government Approved electrical construction.

Red Devil has flights high enough to handle the largest lumps.

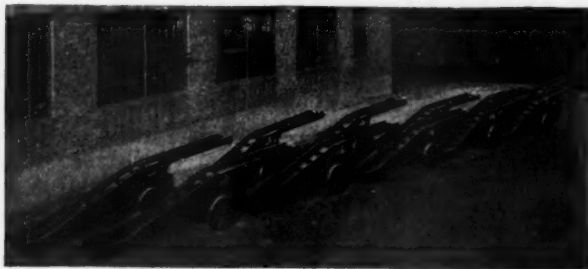
Red Devil is easily moved from place to place because of proper balance upon the axle.

Red Devil is easily operated. All loading adjustments may be made easily and quickly.

Red Devil is fully enclosed, yet readily accessible.



Model 70—for High Coal



Eleven of Seventeen Loaders Shipped to the Union Pacific Coal Co. Rock Springs, Wyo.

GOODMAN

Locomotives - Loaders - Coal Cutters

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For Bottom Cutting in Low Coal



Longwall or Shortwall Mining

Rugged design, simplified construction and low overall dimension adapt the Jeffrey 24-B and the Jeffrey 35-L Coal Cutters to practically every operating condition found in the longwall and shortwall mining of low coal.

Both machines cut on the bottom. The Jeffrey 24-B Longwall bottom cutter is always made to cut directly on the bottom. It can also be furnished as an overcutter. The Jeffrey 35-L Shortwall cutter is ordinarily furnished with bottom pan but can be furnished to cut directly on bottom when desired.

Each machine is equipped with a 50 H. P. motor. Cutter bars are of standard lengths. Centralized and conveniently located control. Furnished with either alternating or direct current.

Although both machines have low overall height they are so designed that complete accessibility to parts may be had—often repairs can be made at the face.

A complete description of the Jeffrey 24-B Longwall Machine or the Jeffrey 35-L Shortwall Machine will be gladly sent on request.

The illustration above shows the Jeffrey 24-B Longwall Coal Cutter. At the right is the Jeffrey 35-L Low Vain Shortwall Coal Cutter. Note the low overall height of the two machines.



The Jeffrey Manufacturing Company
958-99 North Fourth St., Columbus, Ohio

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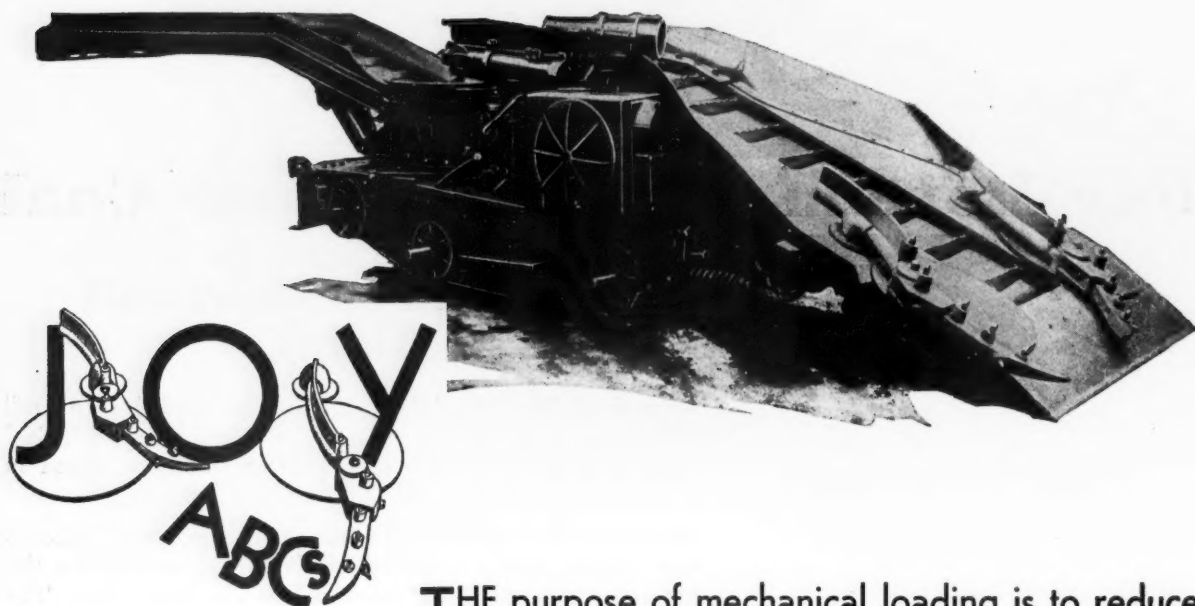
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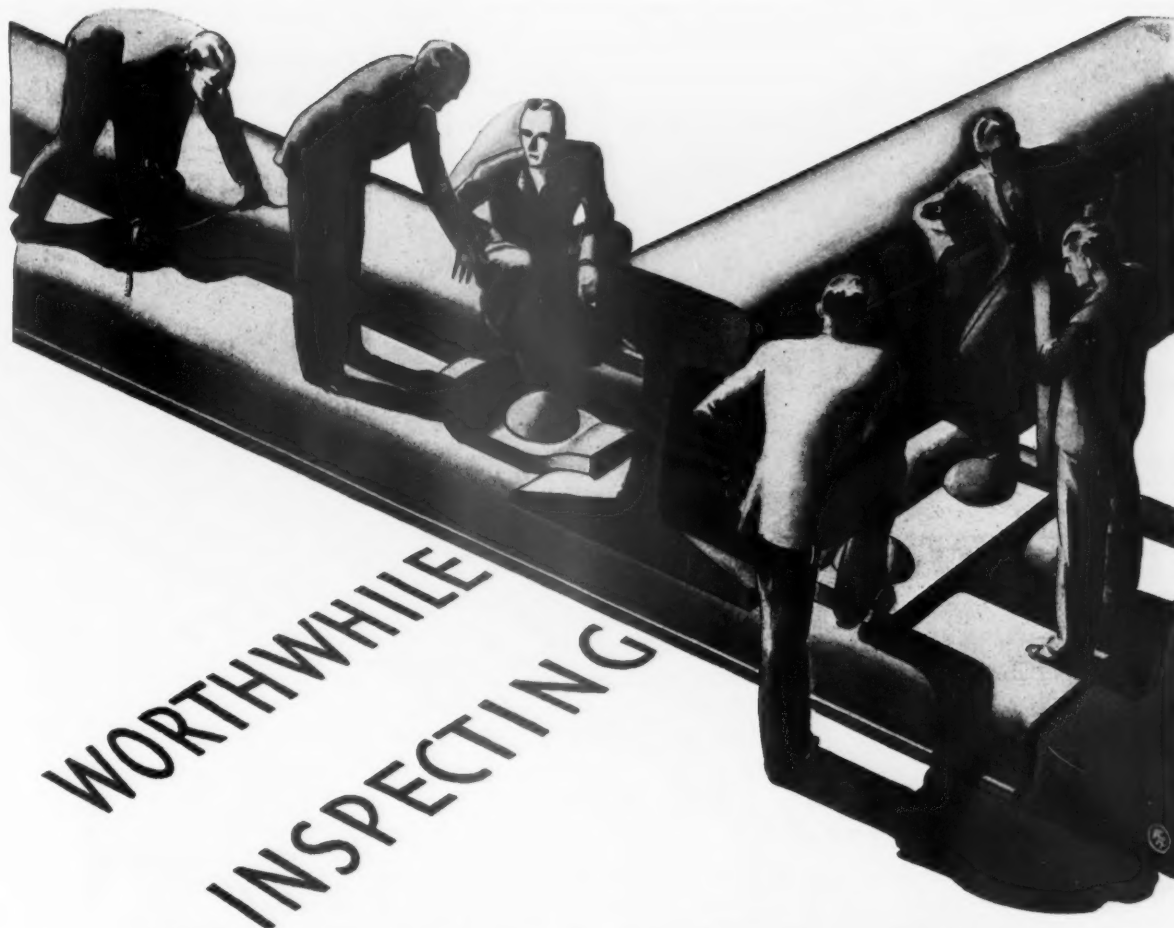
JEFFREY MFG. CO., LTD., OF CANADA: Head Office and Works, Montreal; Branch Office, Toronto; Service Station, 210 Ninth Ave., W., Calgary

A restatement of FUNDAMENTALS



THE purpose of mechanical loading is to reduce cost, save time and concentrate workings—to establish a short cut to coal production. To this end the loader selected is important. It must load rapidly and maintain constant schedules. It must be dependable and it must be flexible and maneuverable. Joy loaders provide a constant stream of coal at two or more tons per minute. They operate on or off track. One man controls all operations. They are adaptable to all systems of mining. They dig as well as load. They quickly move from place to place. These are some of the reasons that the majority of all mechanically mined coal is loaded by these powerful and logical machines. Joy loaders are operating successfully under conditions similar to yours. Let us tell you where and how.

JOY MANUFACTURING COMPANY, FRANKLIN, PA.




THOSE interested in efficient and economical track construction will find Carnegie Copper Steel Mine Ties worthy of their attention. Pictured above is one of the many popular Carnegie sections available. Note its sturdy construction—the broad foot, the wide bearing surface and center groove, which tend to prevent the tie from sinking into soft bottom. This section is light and strong, and its shallow depth recommends its use in low seams of

coal. The outside fastening is securely riveted to the tie. Double inside clips clinch the rail, insuring true-to-gauge construction. No special tools or fittings are necessary in laying the tie. A hammer blow locks the clips.

Carnegie Copper Steel Mine Ties are efficient tools of modern mining. They are rust-resistant, thus assuring a much longer life than ordinary steel ties can give. Literature, descriptive of the entire line, will be sent at your request.

CARNEGIE STEEL COMPANY - PITTSBURGH, PA.

Subsidiary of United  States Steel Corporation

87

CARNEGIE COPPER STEEL MINE TIES

**-because
we build
them BETTER**

SERVICE costs money—no matter who pays for it.

The simplest, surest way to reduce service costs to us and loss of time to Cosco owners, is to build Cosco Conveyors so well that they require the absolute minimum of "time off."

Every detail of construction—not only basic design, but every gear, every bolt, every rivet must withstand the severest usage to which they'll ever be put.

Many hundreds of successful installations in leading American mines speak volumes for Cosco Conveyor design—and the lowest record of "off duty" tells an eloquent story of durable service.

Let us show you positive proof of what Cosco Shaker Conveyor Drives, with the Duckbill, can accomplish in your mines—in increased production at lower cost and surer profits.

CONVEYOR SALES CO., INC.

299 Broadway, New York

District Sales Offices

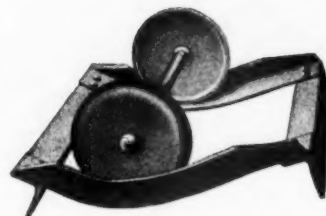
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Shaker CONVEYOR

**Elasticity with
Great Strength**

Cosco Troughs are made of special analyses open hearth Manganese steel plate proved by sixteen years' experience most resistant to abrasion and corrosion. Joints are accurately fitted and easily connected.



**Improved Flanged
Steel Rollers**

Flanged and fixed to axles in one operation. Curved on inner edge to fit cradles perfectly. Infinitely stronger than rollers made from any cast materials.



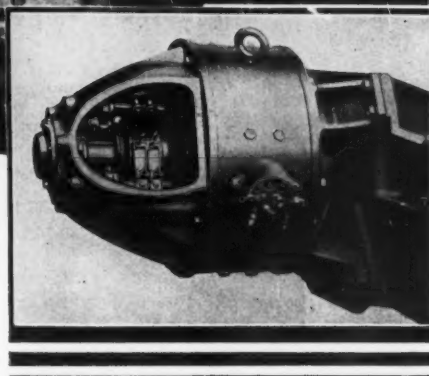
**Rivets That
Stay Put**

Upper illustration shows the usual way of riveting troughs. Note in lower illustration how Cosco Troughs are riveted. Practically four times as much trough metal is held by the rivet head, making unions that will not easily loosen or tear out.

"Convey Your Coal The Cosco Way"



The new COSCO shaker conveyor, equipped with the C-20 drive and powered by Westinghouse.



A Westinghouse SK Motor, industry's most popular general purpose d-c. motor, powers the new C-20 drive.

Cooperation

- - - builds an improved Shaker Conveyor

IN the development of an improved shaker conveyor drive by the Conveyor Sales Company, Inc., greater capacity, lower power consumption, smoother operation and increased flexibility of application were the objectives to be attained. According to the makers, the new C-20 drive, the result of this engineering study, has effected an increased efficiency of 50 per cent over previous shaker drives.

And here again Westinghouse engineers have

assisted the manufacturer of mining equipment in the application of electric motors and control to an improved product. Backed by more than forty years' experience in coal mining operations, Westinghouse engineers are particularly fitted to cooperate with the builders of mining machinery for every phase of production—from the working face to the loading boom.

This service is available to you. An engineer in our nearest office will gladly assist you.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

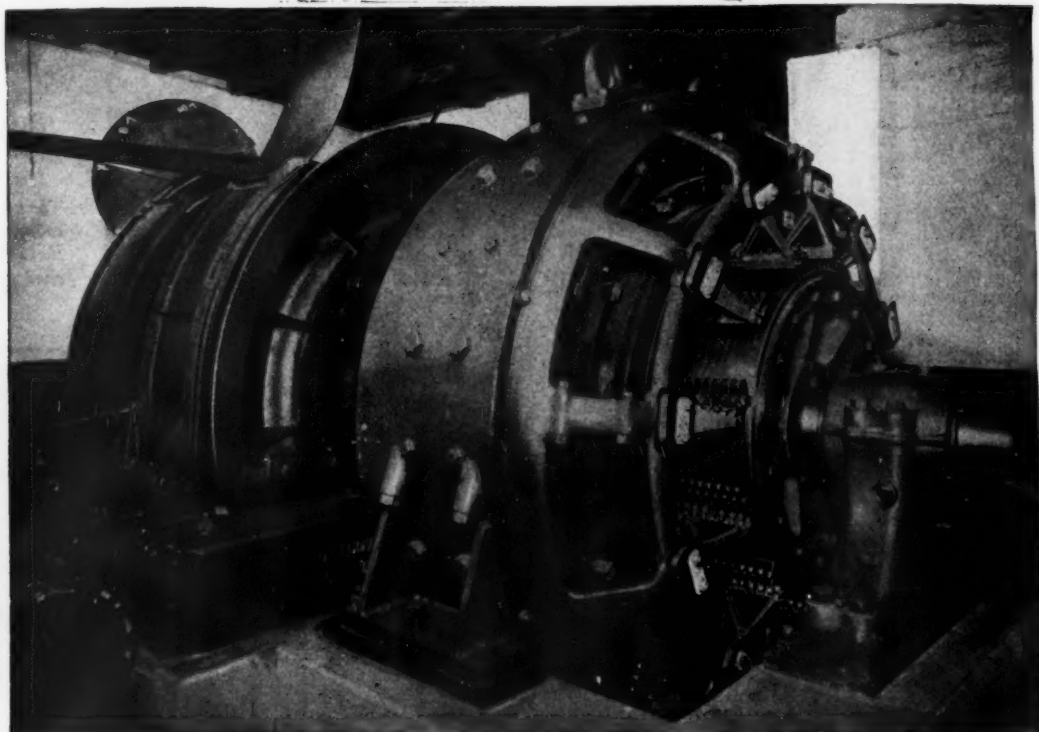


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TUNE IN THE WESTINGHOUSE SALUTE OVER THE N. B. C. NATION-WIDE NETWORK EVERY TUESDAY EVENING.

4.4 TRIPS PER MINUTE

Peabody's Brilliant Hoisting Record



This is the G-E 850-hp. hoist equipment that recently set a brilliant record of 264 trips in one hour at the No. 53 mine of Peabody Coal Company

AT Springfield, Illinois, in the 284-foot-deep shaft of the Peabody Coal Company, the cages of this G-E motorized hoist are speeding up and down, shift after shift, at 3,300 feet per minute—nearly 40 miles per hour. The speed of ordinary passenger elevators is around 500 feet per minute—less than one-sixth as fast.

Recently, in the last sixty minutes of an eight-hour shift, this super-hoist, which was designed to make 230 trips per hour, made 264—an average of 13.65 seconds per trip. The G-E hoist equipment met this

added burden adequately and dependably. Here was teamwork at its best: the fastest hoist of its kind in the world functioning in harmony with the carefully designed and smoothly working arrangements of the Peabody mine.

As at the Peabody mine, so at other noteworthy installations, operators are demanding much of G-E hoist equipment—demanding 100 per cent satisfaction in reliability, economy, and speed—demanding all these and finding that G-E equipment helps them in setting new and higher standards.

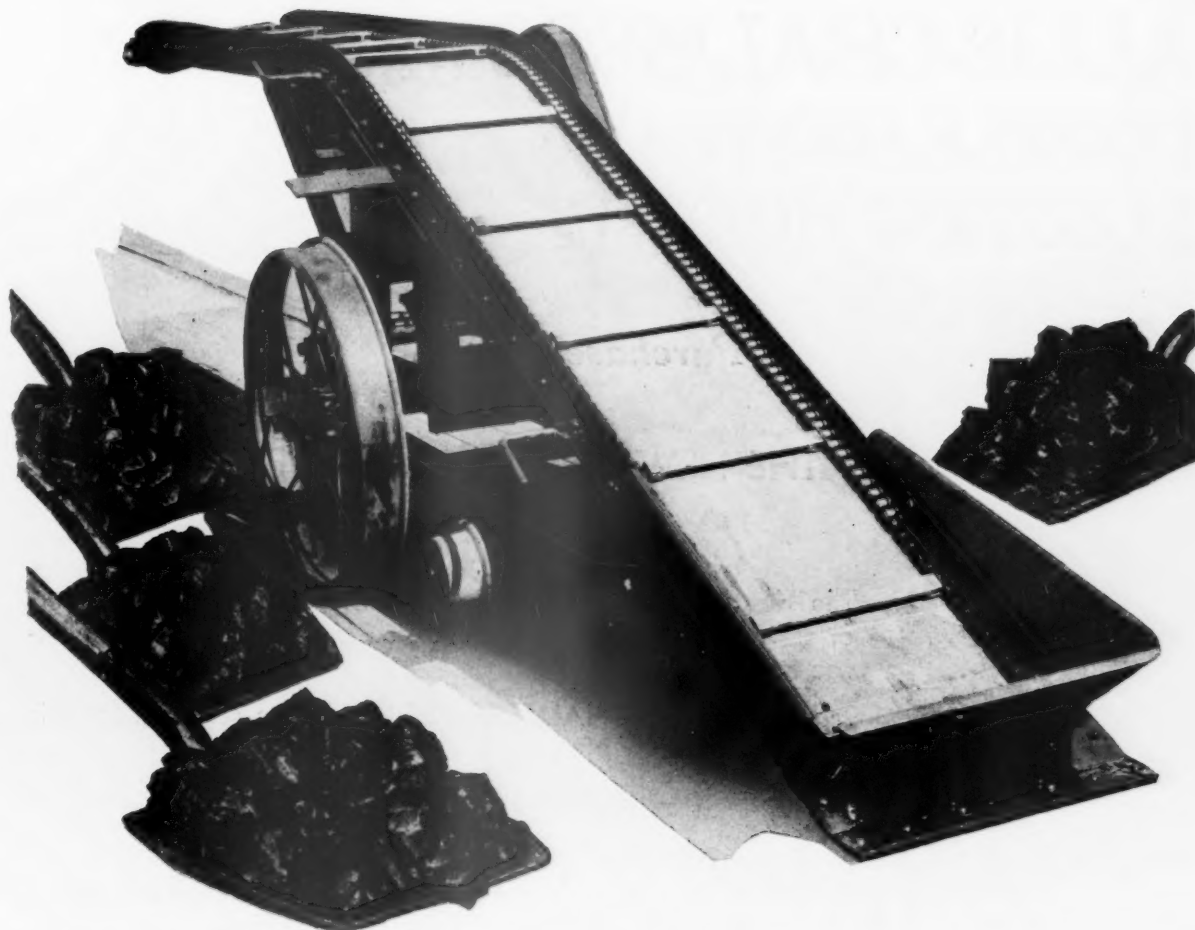


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237-46

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES



Let four men try to cover one up

TO give you an idea of how efficient this easy handling and sturdy machine is, watch it walk away with all that four men can feed it. It is not only efficient and capable. It is simple in design with many friction reducing and stamina insuring features. The ball bearings housed and sealed in grease, the Z-bar frame and ready accessibility of all parts

make it a sturdy, dependable and strength saving means of mechanical loading. Let us tell you more of the advantages this machine offers in adapting mechanical loading to your mining system.

The Mt. Vernon Car Manufacturing Co.

Mount Vernon, Illinois

MT. VERNON PIT CAR LOADERS



IN A SECOND
ready to move or ready to load



ALLIS-CHALMERS DOUBLE DRUM ELECTRIC HOIST

Purchased For

THE NEWPORT MINE ELECTRIFICATION Ironwood, Michigan

The Newport Mine of the Youngstown Sheet & Tube Co. and operated by Pickands, Mather & Co., is being changed to electric operation.

Again an ALLIS-CHALMERS Hoist has been selected for this large program.

Specifications of New Hoist

Maximum Rope Pull 30,500 Lbs.
Maximum Rope Speed 1,000 Feet Per Minute
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10 Ft. Dia. by 6 Ft. Face Welded Plate Steel Drums
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Welded Steel Bedplate
Latest Safety Devices

Maximum Loading

Cage 6,000 Lbs. Load on Cage 9,000 Lbs.
4,500 Ft. 1 3-8 In. Rope 15,500 Lbs.

For the Latest and Best in Hoist Design
an ALLIS-CHALMERS Hoist is Usually Selected

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee —

Progress *in* Mining



The First White Man to Mine Lead in America

When the Sauk and Fox Indians in 1788 gave permission to Julien Dubuque, an Indian trader, to work the Illinois lead mines which they had operated for centuries, Dubuque gained historical significance as the first white man to mine lead in America.

AMERICA'S mines in 1928 produced 627,000 tons of lead ore, valued at \$72,000,000—a development which would have been impossible without modern explosives, scientifically used.

In the country's pioneer days, dynamite was unknown. About 1860, came the first crude dynamites, which, though haphazardly used, sufficed until keener competition necessitated lower mining costs. Then arose the demand for better explosives and better ways of using them—the demand for explosives research.

For example, when it was apparent that large scale operations were necessary for economical production, explosives research improved the gelatins so that their fumes were satisfactory for underground use.

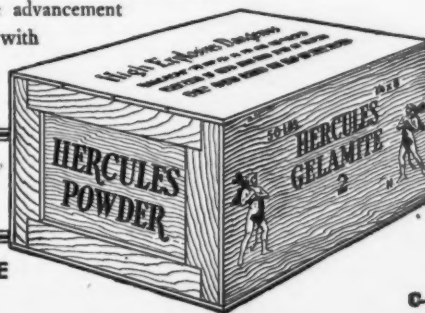
Spurred by the desire for greater value in explosives of the gelatin type, Hercules research brought forth the Gelamites which are far more economical than the gelatins and can replace gelatin satisfactorily under most conditions. With greater explosives values like this have come better methods of drilling and placing charges with the result that mining costs today are being lowered to a point undreamed of a few years ago.

Constant research for better explosives values; insistence on high quality; accurate control in manufacture; exhaustive field tests of new explosives; and advisory service to assist in determining the best methods of application—these are features of Hercules explosives and service that assure full, honest value today and portend future advancement in keeping with mining progress.

HERCULES POWDER COMPANY
INCORPORATED

934 KING STREET

WILMINGTON, DELAWARE



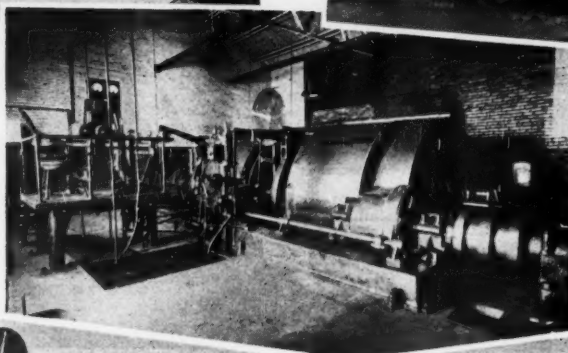
VULCAN



5 1/2 ton storage battery locomotive, furnished for the Cranberry Creek Coal Co.

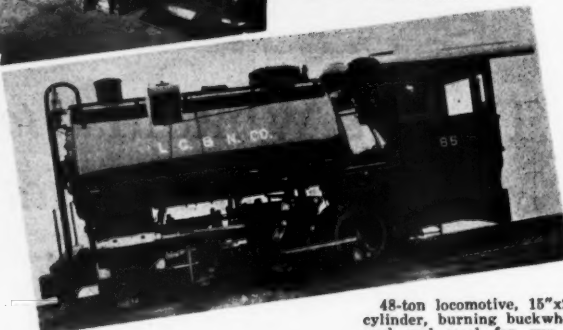
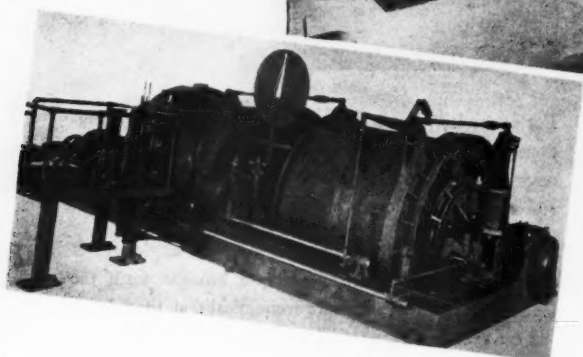


80-ton steam locomotive, 19" x 24" cylinder. 4' 8 1/2" gauge. Burns buckwheat coal and used for heavy rock dump haulage.



1,200 H.P. electric hoist. Drum dia., 9'; rope speed, 1,872 F.P.M.; rope dia., 1 1/2"; weight of cage, 11,000 lbs.; and weight of loaded car, 11,500 lbs. Capacity, 80 cars per hour.

1,200 H.P. electric hoist. Drum dia., 9'; rope speed, 1,872 F.P.M.; rope dia., 1 1/2"; weight of cage, 11,000 lbs. Capacity, 71 cars per hour. Two installed.



48-ton locomotive, 15"x22" cylinder, burning buckwheat coal and used for run of mine haulage.

IN ANTHRACITE

For many years the Vulcan Iron Works has been supplying the anthracite producing companies with an increasing volume of widely varied mechanical equipment—keeping pace at all times with the advances brought about by substitution of electric power for steam—the use of steel instead of cast iron, and the more general introduction of labor-saving appliances.

The same advanced engineering practice, high-grade materials and careful workmanship that have enabled us to meet the exacting requirements of these great anthracite producers have also enabled us during the same period to extend our business throughout the mining fields of almost the entire world. Wherever coal and ore are mined, Vulcan hoists, locomotives and other equipment will be found, giving superior service and satisfaction.

Correspondence invited regarding any problem involving coal handling, coal preparation or mine ventilation.

VULCAN IRON WORKS

WILKES-BARRE, PENNA.



Oxwelding for Economy

Through the use of oxy-acetylene welding for maintenance and repair, substantial economies in operating costs can be effected.

In almost every scrap-pile there are thousands of dollars' worth of damaged or worn tools and equipment, much of which could be welded into perfect condition and restored to service at a fraction of its replacement cost.

A foundry, realizing this, now saves \$72,000 a year by oxwelding cracked pipe flasks that were formerly discarded.

Such a saving, while large, is not unusual. It can be duplicated in practically every industry that uses metal. Investigate the possibilities of oxwelding. It will pay. We shall be glad to furnish you with further information.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

126 Producing Plants



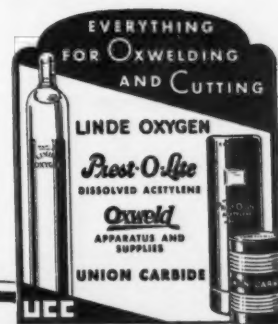
627 Warehouse Stores

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

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WASTE vs. CONSERVATION

A Vital Subject in the Mining Industry Today



—Photo by Forest Products Laboratory.

Zinc Chloride treated timber (marked 6) installed in 1914, still sound today! Untreated timber was renewed several times during this period.

IN the past few years, many large mine operators have begun to eliminate waste by preserving their timbers from rot and decay.

Numerous actual experiences prove that mine timbers, treated with Zinc Chloride, have many times the life of untreated timbers. And statistics show that remarkable economies always result when wood is rendered rot-proof and termite resistant.

The law of economics will soon cause *all* mining concerns to treat their timbers with Zinc Chloride in order to gain reductions in cost of replacements and overhead. For only those operators whose operative costs are lowest can hope to make greatest profits in this highly competitive industry.

The cost of preserving mine timbers with Grasselli Zinc Chloride is so slight that you cannot afford to do without it. Write for detailed information.

The Grasselli Chemical Co.

Incorporated

Founded 1839

CLEVELAND, OHIO

Branches in Principal Cities



Z GRASSELLI INC CHLORIDE

A Positive Preventive of DECAY in Mine Timbers



**KEEPING
DOLLARS
FROM
WAITING
ON
DIMES**

When Locomotives send out distress signals

WHEN the motors of locomotives whine and slow their usual speed on the loaded up-grade hauls, frequently it is the distress signal of low voltage—the signal that “dollars are waiting on dimes.” It is not unusual to find the cause for this low voltage in the bonding—poor bonds, poor welding, or no bonds at all.

Such distress signals can well be answered with a test of the rail resistance in the return circuit. This will locate the bad joints which then can be re-bonded. Profit-minded men will further safeguard their interests by using bonds that positively reduce trouble. Such men through experience have discovered that O-B Bonds are more easily applied than ordinary bonds. Because of this, the resulting weld is more certain to be good. O-B Bonds, they also find, are high in mechanical strength; the resistance of the bonded joint is less; bond replacements are fewer.

Are you familiar with the low year-to-year cost advantages of O-B Bonds? Why not order a quantity of these better bonds? You will be pleased with the results.

Ohio Brass Company, Mansfield, Ohio
Canadian Ohio Brass Co., Limited
Niagara Falls, Canada
1278M



AW-13 Rail Bond



AW-12 Rail Bond

Direct Connections to Better Return Circuits

The proper lay in the cable; the correct design of the terminal; the internal copper sleeve; the special care given to small but important details in manufacture, make O-B Bonds outstanding in their ability to stop power losses in the return circuit. Bonds for all types of service are shown on pages 653-715, O-B Catalog No. 20.

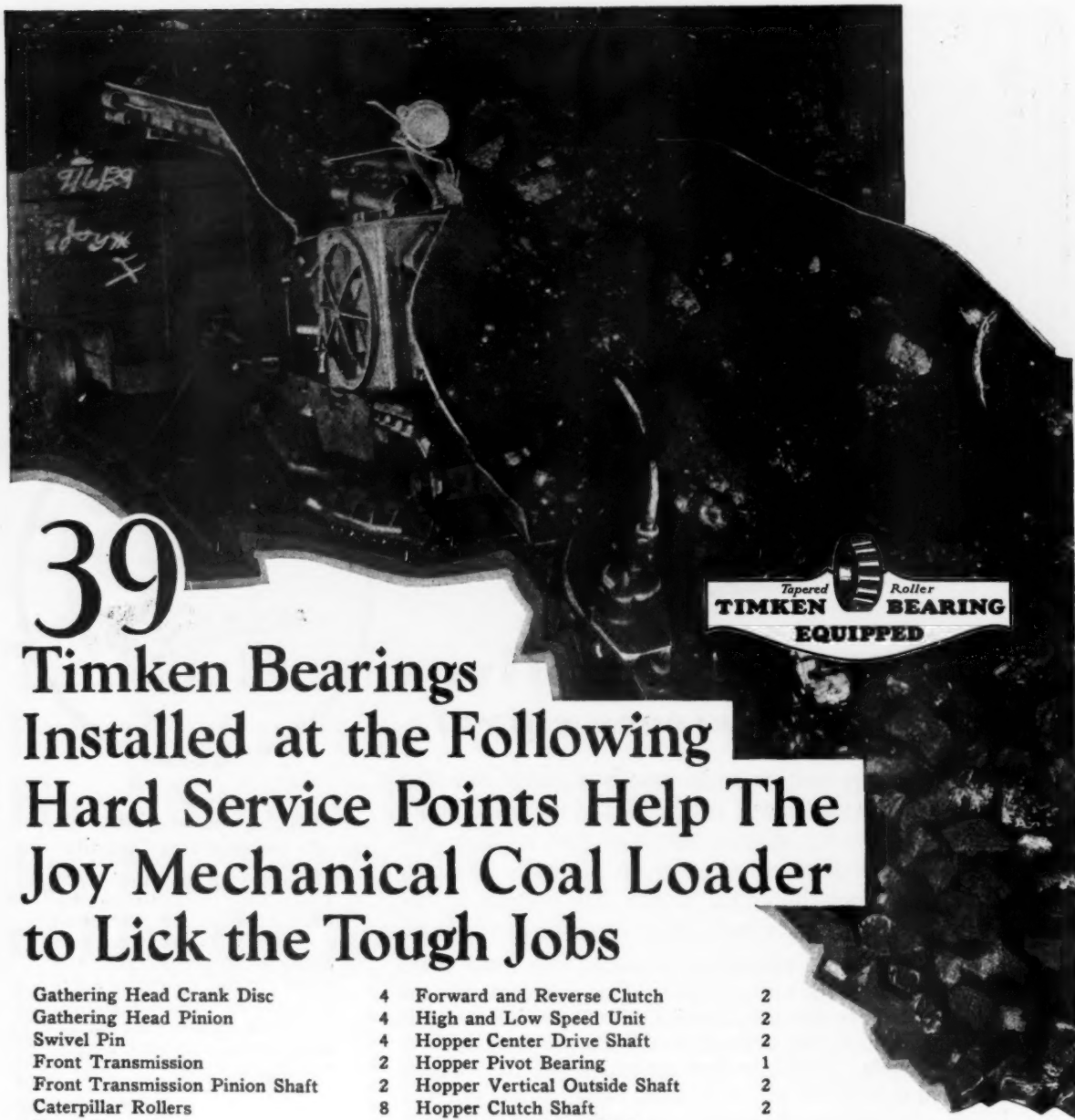
More New O-B Profit Makers

O-B Catalog Supplement No. 4 contains 26 entirely new products perfected since the issuance of Catalog Supplement No. 3. Are you familiar with these? The New Catalog Supplement No. 4 will repay the careful reading which many will give it.

Ohio Brass Co.

NEW YORK PITTSBURGH CHICAGO CLEVELAND ST. LOUIS ATLANTA DALLAS
PHILADELPHIA BOSTON LOS ANGELES SAN FRANCISCO SEATTLE

PORCELAIN
INSULATORS
LINE MATERIALS
RAIL BONDS
CAR EQUIPMENT
MINING
MATERIALS
VALVES



39

Timken Bearings Installed at the Following Hard Service Points Help The Joy Mechanical Coal Loader to Lick the Tough Jobs

Gathering Head Crank Disc	4	Forward and Reverse Clutch	2
Gathering Head Pinion	4	High and Low Speed Unit	2
Swivel Pin	4	Hopper Center Drive Shaft	2
Front Transmission	2	Hopper Pivot Bearing	1
Front Transmission Pinion Shaft	2	Hopper Vertical Outside Shaft	2
Caterpillar Rollers	8	Hopper Clutch Shaft	2
Pump Drive Case	2	Hopper Main Drive Shaft	2

You know the stuff a loader has to have to be able to stand the kind of gaff illustrated above—day in and day out—especially during the heaviest production periods.

The Joy Manufacturing Company, Franklin, Pa., has made ample provision for all modern anti-friction necessities at the vital points of the Joy 5 BU Type Loader, by equipping it with the same bearings that are so generally used in mine cars, electric locomotives, conveyors, motors, pumps, blowers

and all other types of equipment throughout the mining industry.

Why do Timkens dominate? Because the exclusive combination of Timken tapered construction, Timken positively aligned rolls and Timken-made steel has shown itself supremely capable of meeting all demands—driving friction to the verge of elimination; saving power and lubricant; safely carrying radial, thrust and combined loads; adding many extra years of usefulness to machine life. The Timken Roller Bearing Company, Canton, O.

TIMKEN Tapered Roller BEARINGS

The MINING CONGRESS JOURNAL

A Monthly Magazine—The Spokesman For The Mining Industry—
Published By The American Mining Congress

VOLUME 17

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No. 2

Editorials

The Year 1930

FOR a country with everything at its elbow to make for prosperity, with willing workers, with vast capital, 1930 has proved us to be a country of wailers. From Maine to California, from Washington to Florida and all the in-betweens, has come a mighty wail. We are poor. We must economize; must retrench. In various cities the business people have freely admitted that times aren't so bad there, but that the situation in the neighboring, and competitive city, is pretty bad.

Ravens. Whole flocks of them have been flying over the United States, and their dismal squawk has rebounded and re-echoed. Politicians have taken it up, and lamentations arise in profuse volume.

Last year we pointed out: There are 110,000,000 people in the United States. Each must be fed, clothed, transported, housed and amused.

Where is this vaunted ability that business has been wont to parade, upon occasion? Have the brains of America taken a back seat, or have they gone into voluntary retirement?

According to the National Chamber of Commerce, in 1930 we loaded and unloaded 45,800,000 freight cars, in spite of the competition of some three millions of trucks; we made and sold automobiles to the tune of \$2,159,600,000; we produced and consumed 399 million barrels of oil; we manufactured and sold 315 million pairs of shoes; we provided work for more than forty million workers; industry paid in dividends four and one-half billion dollars. The mining industry contributed substantially, although not to the extent of 1929, but we did produce five hundred million tons of coal, 1,365,000,000 pounds of copper; 542,450 tons of lead, 600,910 tons of zinc, and 58,359,000 tons of iron.

The world isn't such a bad place after all.

Congress

PRACTICALLY every day some editorial writer takes a whack at Congress. It is easy to stand on the sideline and hurl bombs into the fray, and we of the press do so with gusto. Nevertheless, the present session of Congress has laid itself open to the criticism that has been directed toward it because of the acts of some few in Congress who will play politics at the expense of the country. As a whole, the great body of Congressmen are trying to carry out the wishes of their constituents. are trying to conduct the country's affairs with efficiency and dispatch.

And the country has made it fairly plain, even to the most demagogic Congressman, that what it desires is

that this session shall pass the usual appropriation bills, stick to its duty on routine, and adjourn without further ado. In spite of this rather emphatic mandate, it is an even toss up as to whether or not we shall have Congress with us during the summer months, in extra session. In fact, there is a strong impression here that decisive steps must be taken to prevent a legislative jam which will block appropriation bills and force an extra session.

Essential legislation is not far advanced in the Senate, and there is no indication that that body intends to hurry, in spite of the threat of night sessions, and the possibility of continuous session to prevent filibusters. Hours have been consumed in useless debate, attempting to justify the procedure in the Power Commission appointments and the possibility of court procedure to determine the legality of these appointments. The only appropriation bill passed so far carries a \$3,000,000 rider, which means that the House conferees will hold it up, pending approval.

It seems unbelievable that an extra session is possible in the face of such strong adverse public opinion, but unquestionably there will be one unless leaders take very positive and drastic steps at this time. Congress should stop playing politics, wash up its slate and go home.

A Ray of Hope for Silver

THE Annual Review of the Silver Market by Handy and Harman presents a month-by-month review of the continually falling price of silver during the year 1930. It is shown that the world production of silver during that year declined approximately 17,000,000 ounces from the production of 1929. Of this amount, the United States produced 50,400,000 ounces, this, with Peru, being the only countries which recorded a substantial decrease in production.

While the Handy and Harman report figures show the continuous decline, yet there is a note of encouragement in the summing up of this report in the following language:

"When the purchasing power of the rest of the world revives, thereby creating more favorable trade balances for India and China through the sale of their products at higher prices; when internal conditions within these two countries permit of greater productive activity and improved standards of living; then, in our opinion, we shall see increased consumption in the Far East, because it is inconceivable to us that these 750,000,000 people are ready to change the habit of centuries, and accept the demonetization of silver."

One National Organization

between the mining industry and unfair proposals against it, and the open door to a cooperative effort that offers limitless opportunity, a common denominator that reduces each problem to its simplest equation, and through its wide resources achieves where a lesser organization would fail."

Just what is this organization, and why should it receive the laurel upon its brow?

It is the only organization in the world that attempts to coordinate into one unit the widely diversified, yet closely related, branches of the mining industry.

It is the only organization that successfully welds into one, practical operation and economic importance; that furnishes the means whereby the problems common to coal and copper, lead and iron, silver and zinc, may come together and present a united front.

It has 34 years of interesting and successful history back of it. It has no failures on its shield. It has a reputation for absolute fairness and impartiality in the presentation of its information to the National Congress, to the state legislatures and to the industry itself.

It deserves the laurel wreath and more—it deserves the wholehearted financial and moral support of every mining man, of every producing company, of every unit that makes up our mining industry.

Its activities do not duplicate those of other organizations. Its work strengthens those organizations and it speaks only upon those things which the industry itself has formulated opinions and procedure.

It accepts the flowers, and offers—service.

An Industrial Survey

ARRANGEMENTS effected by the American Mining Congress and the Arkansas State Chamber of Commerce contemplate an exhaustive and detailed study of the flow of goods in Arkansas so that not only may new industries be intelligently sought but also the greatest advantage may be secured in the acquisition of new markets for Arkansas products.

This survey will embrace every shipment in carload lots to and from Arkansas over a one-year period, and their subsequent analysis. The headquarters of the State Chamber of Commerce at Little Rock will be the central clearing house and point of contact in the conduct of this survey. The plan contemplates the solicitation and utilization of the cooperation of various organizations in the State, including the Rotary, Kiwanis, Exchange, Civitan, Canopus and other service clubs, chambers of commerce, industrial organizations and agents of railroads and public utilities, lumber companies, and manufacturers and producers.

The movement is described as "State-wide, unselfish, and without financial profits to any group connected with it," and the results of the survey will be available to every taxpayer in the State and others outside the State who may be interested in the development or use of the resources of the State. Statement has been made that the survey will mark "the most constructive effort that has yet been attempted in Arkansas," as the results will give pertinent facts upon which the interested capitalist, manufacturer, or producer may intelligently predicate his plans for expansion or for the establishment of a new industry.

These surveys in Arkansas are in line with the policy of the American Mining Congress, which during the past 10 years has maintained a Southern Division for the purpose of bringing about a well-balanced development of natural resources in the great southern mineral em-

pire. As a part of this activity an Industrial Development Conference is held each year at some strategic point in the South, which is attended by bankers, railroad executives, engineers, geologists, executives of chambers of commerce, and industrialists. This year's conference will be held at Louisville, Ky., March 16-18.

It has been pointed out that concerted effort in the development of industries in Arkansas will create new values as the basis for sound taxation. The forthcoming Flow of Goods Survey will make available a classification of every industry in Arkansas covering the 106 towns in the state having a population of more than 1,000. When these surveys are completed and tabulated there will be available important data concerning each of the potential industrial sites in the state.

Competition for Freight

THE men charged with the conduct of affairs in the operation of our railroads are thinking hard, meeting, discussing and doing everything available in planning and research to meet the ever-increasing inroads made on the railroad revenues by their lusty young competitors—the automobile, the coastal shipping, the pipe lines, and the airplanes. One of the greatest sources of freight revenue—coal—is suffering replacement in a serious measure through petroleum and gas transported in pipe lines.

In the early days of the railroad, when extensive construction was in progress through nonrevenue territory, it was necessary to extend material encouragement through Government subsidy. Today it is an interesting thought that these same very important transportation mediums are now subject to loss in revenue through activities in part subsidized from the same source.

The automobile with bus and truck enjoys excellent highways made possible by Federal aid, with well-chosen specifications on minimum curvature and maximum grade. Thus the right of way for the young and growing method of transport is provided—FREE.

The development of our merchant marine is of vital importance, particularly as it will eventually provide a means of livelihood, directly and indirectly, for perhaps ten million of our population. An abundance of good ships is of paramount importance in the event of a national emergency. Coastal shipping is incidental to the well-rounded-out merchant marine service, and as such receives the proper favor of the Federal Government, but it can not be denied that goods are moving from the Atlantic to the Pacific seaboard in ships; which same goods would otherwise today be thankfully received and transported by any or all of the transcontinental railroad systems.

Authorities, if such there be, are not as yet in full agreement as to the future of air transport. There is a line running between Washington and New York that has enjoyed a large patronage, carrying passengers at approximately the same fare charged by the railroads. The Federal Government has made more probable the ultimate success in operation our transcontinental and other airways by leading the way with air-mail lines and by the placement of beacon lights, landing fields, and radio conveniences, and the work is highly commendable. However, every pay passenger in an airship was a potential source of revenue to the railroad which the airway usually parallels.

And so in the relentless march of progress the railroads have their problems as had, in their day, the ox cart and the pony express, with the pointed difference that at least until pipe line practice is greatly improved and refined the railroads are vital to the country's welfare.

Unemployment Insurance

IN THE present epidemic of investigation and feverish desire of our political friends to do something for the unemployed, no avenue is left unexplored, and many legislative proposals are advanced, among them unemployment insurance.

No one likes to see willing workers suffering because of the inefficiency of our industrial system. Great interest attaches to the conference called by Governor Roosevelt of New York, to consider "government's responsibility for relief and prevention of unemployment." The states so invited were New York, New Jersey, Pennsylvania, Ohio, Massachusetts, Connecticut, and Rhode Island. It also is interesting to note that these states represent one twentieth of the total area of the United States; have 32 percent of the country's population; represent 49 percent of all wage earners; pay 46 percent of the total income tax; and pay 52 percent of all wages paid in the United States. Representing such an array of labor, any action taken by these seven states is of more than ordinary importance to the country as a whole.

Various schemes are being advocated, and many are stressing the importance of unemployment insurance. The American Association for Labor Legislation points out:

"The individual worker can not foretell whether he will be unemployed, and if so, for how long, with the result that he can not estimate the provision which he should make for its possible occurrence. When persons or property are faced with such a hazard, they insure the risk. No person of business experience expects to carry insufficient reserve to meet the uncertain hazard of fire—he insures the risk. Why shouldn't the loss of earnings during unemployment, when its incidence is uncertain as far as the individual workman is concerned, be met in the same business-like way, namely by insurance? This method has been adopted already to meet loss of income during incapacity due to industrial accident."

On the other hand, those opposed to this type of relief, point out that it automatically transfers the responsibility for unemployment from the shoulders of industry to the shoulders of government. That industry will not assume the burden of creating jobs for large groups, if the Government will provide through taxation. They also point out that the vast preponderance of American workmen are not looking for a dole, but for a job, and that such a system breaks down morale. They insist that the workman be paid a sufficient wage to enable him to protect himself for the rainy day, thus permitting the American workmen to provide for unemployment insurance upon a self-respecting basis.

Certainly public opinion has not had sufficient time to develop upon this subject, and there is a wide difference between the two schools of thought. Governor Roosevelt's conference has recommended that employment insurance can not be made effective in sufficient time to be used as an emergency measure. They recommend a thorough study and investigation of the subject.

Sauce for the Goose and the Gander

THE 44 legislatures that are in session this year have thus early indicated the trend legislation will take. Tax reform will be popular. In all of the states the problem of ever-increasing taxes and steadily mounting demands for public improvements have been coupled with decreasing revenue and loud howls from groups who have been taxed.

The *Wall Street Journal* recently commented upon the

very human attitude of industry, of people, and of states upon this problem of tax, saying:

"From every part of the United States come reports of an avalanche of 'tax reform' propaganda. Everywhere public expenditures are going up, at the demand of the people, and incidentally with the acceleration provided by local political office holders. The communities—that is 'the public,' including the taxpayers—want the best of service. They want good roads, electrically lighted. They want efficient policing. They want better school houses and better school teachers. They want to be up to date—until the tax bills come in.

"These same people, 'the public,' are just human beings. They want to eat their cake and have it too, and they are distinctly human also in that they can not agree on any plan either to reduce expenses or to shift taxes."

They also point out that no two states agree. In one state an income tax is opposed and a sales tax advocated—in another just the reverse is desired—and so on all the way through the various proposals. What is splendid for Minnesota is vetoed in Florida. With such a wide diversion it certainly seems hopeless to endeavor to find some formula that will fit.

The mining industry is a big part of a very large percentage of our states. It pays 22 percent of our national tax; it is a wasting industry; it is the source of national wealth. Therefore, in any tax reform, state or national, the mining industry is vitally interested, and it is important, that it agree among its various units upon the soundest basis of taxation.

Coal and Oil

AMUSED tolerance typifies the state of mind of the coal industry, as the oil people make a determined effort to win public attention—and sympathy. Oil men are appealing to the Federal departments and the legislative bodies for help. Now what is the matter with oil and what does coal think about it?

For a lifetime the coal industry has been in the condition now causing the outburst from oil men. It is true that there were occasional years when coal at least appeared to do well, as in 1920 when the industry paid one hundred seven million dollars in Federal taxes. But the road has been long and hard, and the present status is not good. Six thousand coal mines stand ready to pour eight hundred million tons of production a year into a market for five hundred fifty million tons, and there are many coal deposits standing ready which may be very quickly brought into production.

Oil has enjoyed a material expansion in coal's natural domestic, railroad, ship and steam fuel market, while controlling the market created by the internal combustion engine, lubrication and other lucrative fields. But today, with billions of barrels of petroleum valved off in wells and subject to immediate production, the shoe is pinching. Furthermore, the devices and methods for oil-finding have made startling progress in even the last three years, and the technique of drilling and development is today such that no estimate or forecast of petroleum production for the future can be made other than to feel that a flood of production is in sight.

Mining men engaged in the production of coal will do well to give serious and exhaustive thought to the state of affairs thus brought about. It is difficult to see wherein oil will receive any more aid in the future than coal has enjoyed in the past, and the inevitable result of such a situation is a merciless competition for markets.

From Face to Tipple

PREPARATIONS are now underway to bring together at Cincinnati, Ohio, during the week of May 11, a great aggregation of practical coal operating men, to discuss ways and means of producing coal more safely and more efficiently.

The American Mining Congress, which sponsors the meeting, has just announced the dates as May 11 to 15 inclusive. The program, which is under the direction of an industry-wide committee, headed by Mr. Ralph E. Taggart, vice president of the Stonega Coke and Coal Company, is developing rapidly, the first draft having already been released to the industry. Sectional meetings of the Program Committee have been held throughout the producing districts, and keener interest than ever is being taken in this great convention. From now until the week of May 11, hundreds of coal men will be busily engaged in gathering and preparing information to be presented to the meeting. The final result of the presentation of the papers so prepared, and the discussion which will follow, will constitute a year-book on coal production advancement. The entire cycle of mining will be presented, from face to tipple, and safety will be the major theme of the meeting.

Every coal man who can possibly arrange to do so will be at Cincinnati during the week of May 11. This annual Cincinnati meeting, which has been held for eight successive years, is a splendid example of what can be done even in an industry so widely divided as coal.

Put the dates down now: May 11 to 15. They present a great opportunity.

A Problem of Real Importance

FIXED rules are necessary to the successful handling of any enterprise. There must be some guideposts along the way of successful management. There are many people who can develop a fairly good set of rules. Most of us are pretty good at telling others "how to do it." But the art of making the rules work is the important thing. Maintaining discipline and enforcing rules is a real problem in any industry and a big one in the mining field. Perhaps this industry has more than its share of rules. They begin with compulsory legislation, continue with recommendations from Government bureaus, and end with the rules demanded by common sense. There are thousands of "you must's" and "you must not's" insofar as the production of minerals is concerned.

Take safety, for instance. Every mine operator sincerely desires the greatest possible safety for the workers. Individual companies have worked out and adopted splendid safety rules. Every day and every year some company somewhere is establishing and hanging up a safety record. There are others who strive to attain the goal of safe production but fail somewhere along the line. Why? The answer seems to be—lack of enforcement of discipline. The personal equation—forcing the worker to live up to the rules. Even those operators handicapped with state interference, labor union demands, plus their other worries, are involved in the same difficult problem—only to a greater degree.

At the Cincinnati meeting scheduled for the week of May 11, under the auspices of The American Mining Congress, an entire session will be devoted to this problem. Different methods adopted by the coal industry will be presented. Just how is the industry handling this problem? In some cases the penalty for violation of rules is drastic; in others, much depends upon the ability of the man in charge. The real thing is that rules are being successfully enforced and, after all, the

thing most desired is safe production. Safety plus—plus efficiency. The Cincinnati meeting will offer a real contribution to this important problem.

The Manufacturers Part

EIGHTY-FIVE percent of the 50,000 square feet of floor space available at the National Exposition of Coal Mine Equipment, held in conjunction with the Annual Convention of Practical Coal Operating Men, has been sold. That statement recently made by the convention management is indicative of the great interest that is developing in the "Cincinnati Meeting" this year. It also shows that the coal industry isn't so backward, isn't so apathetic as its critics would have you believe. When more than one hundred manufacturers find it profitable to present yearly at this meeting their latest equipment, it is certainly an indication that the coal man is receptive to methods for improving his operating practice.

The exposition is a real feature of the convention. It offers a remarkable opportunity to see in a few days' time a vast assemblage of machinery, all designed to help the operator produce his coal more safely and efficiently. To see anything like this display, one would have to spend many hundreds of dollars and travel many hundreds of miles.

This year's exposition will be greater. It will be more interesting. Many new ideas will be presented. Those operators who come to Cincinnati "for to see" will not be disappointed.

Mining in 1930

WE ARE all prone to compare our present with the very best in our past; prone to think every set-back a major one. Recently, a man who had been in the habit of earning and spending a hundred thousand every year found himself forced to accept and live upon one-quarter of that amount. He saw nothing short of penury in \$25,000 and to avoid it took his life. To many, \$25,000 is a gigantic sum. It certainly can bring moderate comfort and luxury. It's all in the state of mind.

In 1928, the mining industry was healthy, happy and reasonably prosperous. In 1929, that industry suddenly acquired wealth. Dividends mounted, production climbed. We were on the crest of the wave. But 1930 was just around the corner, standing with a sharp pin all ready for our beautiful balloon; and now 1930 has passed by us, and as we inventory the result we pull a long face and join the great procession of industry howlers and moodily tell the world that 1930 "did wrong by our Nell."

That is true, in a degree. But, if 1929, with its false promise, had not heaped our hands full of good things, 1930 would not have had so black an eye, for its record compares most favorably with 1928 when none of us felt we could not go forward because our shoes were a bit worn at the heel.

All of us would like to see mining on the boom. When there is an active demand for minerals, there is great prosperity abroad. But because we are reduced does not give us license to cry like spoiled children.

Let's tighten up our belts and go ahead for the mineral industry of this country is its backbone, producing 54 percent of all the freight carried by the railroads; paying 22 percent of the Federal tax income; spending three hundred and fifty millions for equipment and supplies; employing thousands of workers. With more than 12 billions invested mining is one of the most substantial of the country's assets.

PROTECTING and REGAINING TONNAGE

By Harry H. Kurtz*

FIRST of all, so that we may have a better understanding, let me ask you a very personal question. You have all heard a lot during the past few years regarding the development of the small size stokers—but how many of you here today are burning gas in your own homes? How many of you are burning oil?—and how many of you have taken interest enough to install an automatic coal burner in your own homes, so that you might have it under observation to determine what, in your opinion, its future will be with reference to the protection and development of the coal industry?

The thing we coal men are interested in is *tonnage*. This is the most over-worked word in the coal men's lexicon.

Tonnage—the coal operator's god. *Tonnage* we have lost—*tonnage* we want to protect—and *tonnage* we want to regain. It is with this thought in mind that I am talking with you today. What we coal men, and stoker men, can do and how it can be done, to protect our present *tonnage* and to regain lost *tonnage*.

Of course, what your particular group is interested in, is the question of whether the present small stokers will economically and efficiently burn *your own particular coal*. After having agreed to talk to you today, I made a hurried survey through a few Eastern stoker representatives, and found that some very representative buildings and plants are burning your smokeless coal with economy and efficiency. For your information, I give you the names of just a few prominent users you will all recognize, to prove to you that your smokeless coal is now being used satisfactorily in small stokers:

Daggett Chocolate Company, Cambridge, Mass.; Farrington Mfg. Co., Roxbury, Mass.; Boston Elevated Railway, Boston, Mass.; Radcliffe College, Boston, Mass.; First National Bank, Newport News, Va.; Shipyards Apartments, Newport News, Va.; State Planters Bank, Richmond, Va.; Graybar Electric Building, Richmond, Va.; Chastleton Apartments, Washington, D. C.; Georgetown Hospital, Washington, D. C.; Park Lane Apartments, Washington, D. C.; Transportation Building, Washington, D. C.; Wardman Park Hotel, Washington, D. C.

Another question that you are all interested in is, "What size preparation is best adapted for stoker use?" Most small stokers are designed to get best results with from 1¼ to 2-in. screenings. Household, or residence, stokers give better results with a screened pea coal or No. 4 nut. It is hard to classify different coals by name, such as "pea" or "nut" as the different fields use different names, and sometimes the same names designate different sizes in different fields. Coal dust, or "bug dust," yard sweepings or mixtures of various

car bottoms of different kinds and characters of coals, are never desirable.

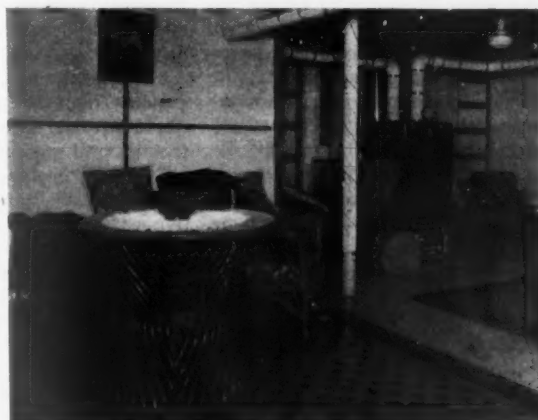
While stokers, if properly installed, are in many cases burning almost anything that looks like coal, nevertheless the stoker cannot develop B. t. u.'s that are not in the coal, nor can it turn dirt, fire clay and cement into heat—and the producer or dealer who is so short-sighted as to figure he is *foxy* when he delivers such a heterogeneous mess to a plant, just because he knows they have a stoker, is pursuing a ruinous policy, and should have his head examined.

A good, clean, dry, free-burning, low sulphur, low ash, without too much dust, coal, is of course, most desirable, but I submit that small stokers are burning coal of many kinds today from one coast to the other, efficiently, satisfactorily and with economy.

Stokers are successfully burning the high grade bituminous coals of the West, the brown lignites of the Dakotas, and higher grade lignites of Colorado, and are successful with all the various eastern coals with the exception of the very heaviest of coking coals. Small stokers are now developed to efficiently burn even anthracite.

There is nothing new about the principle of forced underfiring—this principle has been employed by manufacturers of large stokers for large plants for many years past, but it has only been during the last 8 or 10 years that mechanical stokers have been developed for plants of less than 200 boiler horsepower, and for various types of small boilers down to, and including, hot air furnaces in homes of about 5 horsepower or 500 square feet of radiation. There are today several thousands of automatic coal burners, installed from coast to coast that are giving complete satisfaction to their owners, and, in the various localities are efficiently, economically, and satisfactorily burning *each locality's local and cheapest coal*.

Let us take for granted that we all agree that the development of the small stoker is far past the experimental stage,



The mechanical stoker makes the basement an extra floor

* Representing Stoker Manufacturers Association, Committee of Ten.

Talk before the New River Coal Operators Association at Mount Hope, W. Va., December 3, 1930.

that there are literally thousands in satisfactory use. Nothing need be said, or specific figures given, today to convince us that oil and gas has been encroaching on our tonnage, and have cost us the sale of millions and millions of tons of coal. Right here, let me make the point that for every ton we have lost, the railroads have lost the hauling of this ton, and for every dollar of business we have lost, the railroad has lost from two to three dollars—think of this loss in revenue, and what it means to the railroads. What are we coal men going to do about it? What can we do? Well, gentlemen, there are a lot of things that we can do.

Our coal salesmen should be instructed to learn more about stokers, and to everlastingly support the sale of stokers, and our salesmen should be instructed to urge their retail dealers to pay particular attention to all stoker possibilities and stoker installations, and impress on the dealer the necessity and wisdom of delivering to these stokers a good quality of properly sized coal, that each stoker may work satisfactorily, and thus generate other stoker orders which will all perpetuate the sale of coal.

We, as producers, can install automatic coal burners in our own homes. We can talk them at our bridge parties—we can show them to our guests and friends at every opportunity—we can urge our stockholders to install coal burners. You will be surprised to learn how many of your stockholders that depend on you for dividends are actually burning oil or gas, just because they do not *think*, and just because they have not been told about stokers, and because the oil and gas companies have done a better job of merchandising their product than we coal men have. Tell your stockholders—tell your friends, about the economies, the safety, and the convenience to be enjoyed by burning coal automatically. Tell them what it means to the coal industry—urge them to start and continue the propaganda by telling their friends, and by demonstrating to their friends the installation of a coal-burning device. These things we can all do.

You men here today are men of large affairs. Among your acquaintances, you must number numerous railroad executives, there is no question but that all railroads are tremendously and vitally interested in the revenue that they derive from the hauling of coal. Many railroad executives are taking cognizance of their loss in coal revenue, and are becoming tremendously interested in ways and means for increasing the movement of coal.

The production and distribution of gas and oil are almost entirely mechanical. After the distribution is once arranged for, there is comparatively speaking

very little labor involved thereafter. Now, from an economic standpoint, and providing that coal can be burned more efficiently and more economically and more safely than oil or gas, and providing that our coal market can be increased by making coal attractive to the customer, then surely we can all see how the increased use of coal would affect the country. It will put additional men to work, not only in the mines and mining camps, but additional men to work on the railroads. It will increase the purchasing power of all of these coal camps and communities all over the nation. It provides one of the important answers to the labor question today.

This is a message that we can all help to get before our most influential acquaintances. It is a message that you gentlemen should make every effort to discuss the importance of with your Congressmen.

You gentlemen can do a lot of good work with the officials of various Government departments. It is a crime that so many different Government buildings, including Army posts, are using competitive fuels, when it is my belief that they can be sold on the absolute necessity of the Government itself using coal. This appeal could be based entirely on economic reasons. It is a message of such vital importance that we must find a way to get it before the President. It is such a tremendously important subject that all of you should realize the importance of doing these things, and of keeping on telling the story over and over and over again.

The small stoker today is the coal man's "fighting ally." One of the most important questions confronting the manufacturer of small stokers is how best to merchandise the residence unit. The small industrial units of from 10 to 250 horsepower present a semi-engineering problem, and really the big sales appeal is the economy effected—but another appeal has to be made to the home owners, for it is impossible to show a sufficient saving on an annual coal consumption of from only 8 to 15 tons to warrant the investment in an automatic coal burned from a savings standpoint.

The appeal must be made to the home owners from the point of convenience, cleanliness and safety, together with the fact that all of these things can be had, and with a substantial economy over the cost of either oil or gas. Then the question arises as to through just what channels these residence stokers can best be marketed—plumbers, heating contractors, hardware dealers, radio stores, refrigerator dealers, furniture stores, or just who? It seems to me that the answer is obvious—that the logical distributor for the residence stoker is the retail coal dealer.

Automatic coal burners are not entirely automatic—someone must fill the hopper, and someone must remove the clinker occasionally. Someone must deliver coal efficiently, so as not to create too much dust and dirt in the basement—and again the answer is the retail coal dealer. Retail dealers can work out plans to sell service, which will include all of this service—the delivery of the coal, properly treated, to make it dustless—the installation of an automatic coal burner, furnish a man to fill the hopper—inspect the plant—keep the fire-box clean, and remove the ashes. The owner need not go near his furnace room.

Plans can be worked out whereby such a service can be furnished, and a monthly charge made. This sort of service will be more automatic, safer and more economical than the burning of either oil or gas. The burden of developing this vision and working out schemes to furnish such a service rests with the coal operator and the coal dealer. The coal men should awaken to this opportunity—why should we leave it to the merchants in alien lines to attempt the merchandising and installation of coal burners, whereas it so patently is the problem of the coal men?

This is the message that our salesmen should be instructed to carry to the retailers and talk to them about, over and over and over again.

We are asked many times about the price of stokers—"Why are they so high?"—"When are we going to get the prices down?" Let me quote from a recent article written by the president of the largest manufacturer of small stokers:

"Efficient engineering assistance is essential to the installation and servicing of automatic stokers. Forward-seeing manufacturers have anticipated this need for engineering assistance and have placed in the field specially trained engineers and fuel technicians whose sole duty it is to counsel and assist local dealers and buyers.

"The factory without competent engineering staffs in the home office and in the field is not in a position to build or market a satisfactory stoker and the coal dealer who allows himself to become tied up to a contract with a manufacturer in this group is inviting disaster.

"No stoker has been built that some one could not build a cheaper one.

"The coal dealer entering the stoker business should endeavor to procure for his customers the best possible value, but a cheaply built stoker often proves a high priced experiment, both for the representative and the purchaser. It is reasonable to assume that established manufacturers who are making the bulk of the automatic stokers now in use are in a position to sell at the lowest possible price consistent with good workmanship, high quality of materials and competent engineering service. Their products are giving satisfaction because they are putting only the best into them, and when

a small manufacturer enters the field and features low prices in an attempt to get business it is proof within itself that he is cutting corners, and the maker of a stoker who cuts corners can hardly expect to survive, or to turn out a satisfactory piece of firing equipment."

That's the answer to the question of price by the president of the largest manufacturer of small stokers.

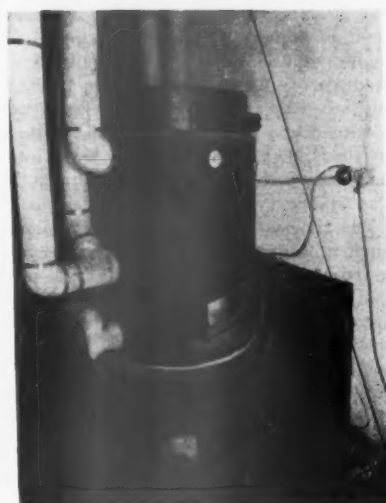
Right here let me urge that our salesmen, while talking stokers to the dealers, should caution the dealers about not being too anxious to take any stoker agency offered. The coal trade journals have carried on a splendid work in telling the retail coal men of the changes which are occurring in the heating world, but so far as we know, none have urged the dealers to grab blindly at stoker franchises. The soundness of this policy will become more and more apparent as time goes on, for the merchandising of automatic coal burners demands judgment, training and experience. Properly handled, the automatic firing of coal will be a tremendous help to the coal-mining industry. It will hold its present tonnage and develop new tonnage. It is the best argument for increasing coal consumption that the coal industry has ever had, and it will be unfortunate indeed if the confidence built up in the automatic stoker is abused through ignorance.

Altogether too many people have felt that because an automatic stoker is made of metal and is used as boiler-room equipment that any one can install and satisfactorily service these machines. Nothing is further from the truth, and a great deal of trouble is in the offing for those who feel that they will be able to handle this equipment as a side line, or that the general run of mechanics are capable of making correct installations.

This is particularly true in the large cities where a large variety of coals are available, all differing in B. t. u. content and in burning characteristics.

Satisfactory installation and servicing of an automatic stoker is a task requiring an exact knowledge, and demands the attention of trained men who understand the connecting up of controls and the making of adjustments which will enable the user to obtain the best results from the various kinds of coal.

Retail coal dealers all over the country are discussing the automatic stoker and wondering what its future holds for them. Some believe the future advantages to be gained will come from co-operation with experienced heating engineers and the experienced representatives of established and successful stoker manufacturers. Others are looking at it from a different angle and are thinking only in terms of the immediate monetary returns which they can realize by



Types of mechanical stokers

obtaining an agency they propose to operate as an adjunct to their retail coal yards. This latter point of view will inevitably result in disaster to the dealer, dissatisfaction to the user, and harm to the coal industry in general.

Coal producers, coal retailers, must take a good look at the future, and see a vision of the possibilities for increasing tonnage. It is discouraging at times to hear some operators talk. Not so long ago I personally talked to a successful operator, and found him violently opposed to the stoker idea—he claimed that we were taking some of his best customers in the residential districts who were burning especially prepared lump coal on which he had a net profit of \$1 per ton, and by the installation of a stoker we were converting his customers to the use of screenings, on which his margin was only 50 cents. He could not understand that this customer was undoubtedly a very good prospect for an oil burner or a gas furnace, nor could he vision that if enough stokers

are sold to properly balance the demand for sizes, that then there is absolutely no reason why he should not eventually enjoy just as much, if not more, profit on the sale of the stoker sizes of coal as on any of the other sizes.

Another operator recently condemned the sale of stokers, because they were creating an additional demand for a size of coal that he was already short of. It is hard to imagine that a man so short-sighted could ever have become successful in any business. Operators themselves must see a different vision.

Many rather successful experiments are being conducted today on coal by chemists and engineers. Nevertheless, it is going to be years before a lot of the ideas now being tested will be commercially profitable, and for the present the problem is to tell the story to the public that there are now on the market devices known as "stokers," that can be installed to burn coal instead of oil or gas, and that these stokers are safer, and are just as convenient when the coal men will have worked out the details of giving service, and are more economical than either oil or gas.

The Committee of Ten believe it is impossible to render the greatest service by independent action—we believe that individual effort, no matter how intelligent, will avail us but little unless all of the allied industries, including the railroad companies, tackle our common problems along coordinated lines—each doing its full part, with a perfect knowledge and understanding of the high, common objective and the contribution each industry must make towards its realization.

There is no question but what we can successfully attack oil and gas. The comparisons of the cost of burning oil and gas as against coal, *stoker fired*, are invariably in favor of coal. The factor of safety is all on the side of coal.

This is something that can and should be stressed, for who among us is not tremendously interested in the safety of his home? Probably there is no better index regarding safety comparisons than the explosion insurance rates. One of the country's leading boiler insurance companies shows rates on coal of from \$10 to \$40 on various low pressure boilers, and high pressure boilers up to 200 square feet of grate surface. Oil-fired rates are from \$50 to \$200—five times as high! Gas rates are shown from \$50 to \$250, or from three to six times as high as coal! In connection with their table of rates this company states, "with the increasing use of oil and gas as fuel for heating and power boilers, there has been an increase in explosions in furnaces and flues caused by accidental ignition of combustible gases collected in these spaces." Explosions of this kind, in addition to the damage to the furnace,

have frequently resulted in serious damage to boilers and to the other parts of the premises. Nothing is said about the personal damage that might well happen, and probably did, in these cases.

A survey made with any fire marshal in any of our towns or cities would give us a lot of ammunition with which to stress the danger of substitute fuels and the safety of coal. The public today demands convenience, and is willing to pay the bill. The oil and gas people have done a wonderful job of merchandising and making the public conscious of the convenience of oil and gas equipment. They have not played fair in their advertising—they have taken plenty of dirty digs at the coal business, and even in their comparisons of figures they invariably compare a modern oil burner or gas furnace with a high-priced coal, hand fired, and then they publish these figures broadcast. Certainly we have never seen them publish a comparison showing the cost of oil or gas as against coal, stoker-fired.

Stokers have been replacing both oil and gas in hundreds of installations during the past two or three years. One stoker company carried a full page ad in the *Chicago Sunday Tribune* of September 21 that should be of vital interest to every coal man. This company advertised signed letters from customers showing savings of over 50 percent between the use of coal, stoker-fired, as against oil, the name of plants, and many figures that can be substantiated. This advertisement appeared in the largest paper in the world in the largest coal-burning area in the world.

Here is what a stoker owner in Denver says:

"Your stoker has proved so satisfactory that I take this liberty of writing you our experience with same.

"We have previously found hand firing unsatisfactory, expensive and without regularity of heat, requiring both day and night fireman. It was wasteful of fuel as combustion was so incomplete half the heat went up the stack, soot choked the boiler flues and we paid to have half our fuel hauled to the dump with the ashes, in the form of coked coal (incompletely burned).

"We installed natural gas burners for the season of 1928-29 and the fuel bill was \$550.

"In October, 1929, we installed the stoker in 25 hp. boiler to heat our fur factory, fur dressing plant, and four apartments. We first investigated all makes of oil burners and found none we thought absolutely reliable, and all too expensive on oil consumption.

"Your stoker is very satisfactory, holds heat evenly day or night at required temperature, has very little smoke as fuel is burned up almost completely, leaving only a few clinkers. It burns the lowest grade coal, or 'car bottoms.' There are very few ashes to remove as combustion is complete. Comparing with hand-firing this saves about 90 per-

cent of the expense of handling ashes and hauling to dump. The forced draft and underfiring of stoker, like a blacksmith forge, gets all the heat out of the coal. It is a pleasant surprise to find that the stoker holds fire for 48 hours if shut off, and starts without rekindling at the snap of the switch and has steam up in 30 minutes.

"Last winter, the coldest in the history of Denver, our coal bill was \$160 with the stoker, as compared with \$550 for natural gas the season before.

"Congratulations on this stoker.

"Yours very truly,

"THE JACK C. MILES FUR COMPANY."

It is impossible to give any exact figures showing the actual number of oil or gas burners replaced with coal burners in this country, but it is true that at least several hundred have been replaced by coal burners. Now, my argument is, that if with the little advertising that has been done regarding the development of stokers, it has been possible to replace oil and gas burners in a few hundred cases, these replacements can be multiplied by thousands, if and when we coal men and allied industries, including railroads, awaken to the possibilities and really get behind the idea—work out a plan and carry through.

The time is coming, and coming soon, when it is going to be possible, by concerted action on the part of the National Coal Association, the American Railway Association, and the manufacturers of heating equipment, particularly stokers, to get together on a real plan of national publicity, promoting the sale of coal as an automatic fuel, economic, safe and efficient, and even more satisfactory than oil and gas. Look what various advertisers have accomplished. The problem today is not one of manufacturing—our manufacturing plants throughout the country are wonderfully efficient and with the machinery we use today, almost any conceivable product can be manufactured in these modern plants. This same remark goes for our coal mines. The producers are prone to give all of their consideration to interesting mine problems, whereas the most important problem facing industry, particularly the coal industry, is the question of distribution which involves intelligent merchandising and advertising—telling the story to Mr. and Mrs. Public. Now look what various industries have done! It is only a few years ago that if we suggested to our butcher that we had a cat, he threw in a hunk of liver. We all know that some doctor discovered and promulgated the idea that liver contains all the vitamins, and was especially good for anemics. Today liver retails for 45 cents per pound, higher than the best steak or turkey.

The Lambert Pharmacal Company of St. Louis a few years ago, figured they had their market saturated. A young man came along with an idea and a word

that none of us had ever used "halitosis." Today, the Lambert Pharmacal Company are doing, not twice as much business, but showing an increase of 2,000 percent in the sale of their product—the product itself, the bottles, packages or labels have not been changed one bit.

Take yeast—it has no appeal—it tastes rotten and smells worse. When the breweries shut down, or were supposed to have shut down—the yeast makers figured they were about through, for something like two-thirds of their product was sold to breweries. A young man with an idea went to one of the big yeast companies and they turned him down cold. He then went to Fleischmann, who listened and thought it was worthy of a trial. They started advertising yeast as a health building food and they are now selling 10 times as much yeast as they did in the wet days.

Take sauer-kraut juice—if your stomach is strong and you can get it by your nose. For years it was a by-product that was run into sewers. Some wise advertising man conceived the idea that it could be sold, put it up in bottles, advertised it, and today it is sold in our leading hotels and restaurants, where it stinks just as bad as it did in the sewers, for from 35 cents to 85 cents per glass.

We are all familiar with what the cement industry has accomplished. There are many many other industrial groups who are doing successful jobs of concerted national advertising.

Coal is the third most important essential of living. We must eat, we must be clothed, and we must have shelter, and the most important factor of shelter is heat. And if coal can be made as convenient and automatic as other fuels, and we know that it can, then why do we not do the job of intelligently telling the public about coal? Why do we not all preach the gospel and back up our convictions by ourselves installing stokers and learning that these things that we preach are possible and can be done? Do you realize that one stoker company has been spending more than \$1,500,000 in a nation-wide sales and advertising campaign in 1930 to build a permanent market for coal, advertising coal as an automatic fuel and doing more than the coal industry itself has done for the industry. This campaign has produced some results, but it is only a drop in the bucket to what can be done and should be done by concerted effort by all of us who are so vitally interested. I am suggesting that we all think of a national advertising campaign—a campaign that will get results. We coal and railroad men have been asleep. It is time to wake up.

As proof that the railroad executives are beginning to take an interest let me quote from a (Continued on page 76)

The IMPORTANCE of SILVER

in the PRODUCTION of ARGENTIFEROUS ORES*

By Charles White Merrill†

SILVER is unique among the metals in that but two-fifths of its production is derived from ores more valuable for silver than for other metals therein contained. Thus price is of less weight in controlling silver production than is price in the production of other metals. The relations of silver revenue to total ore revenue in the production of argentiferous ores, accordingly, is not only of importance to the silver industry but is a factor of considerable consequence to the production of gold, copper, lead, and zinc.

The recent decline in silver price to levels never before recorded, therefore, has provoked much inquiry as to the extent to which silver is a by-product of

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† Associate mineral economist, U. S. Bureau of Mines.

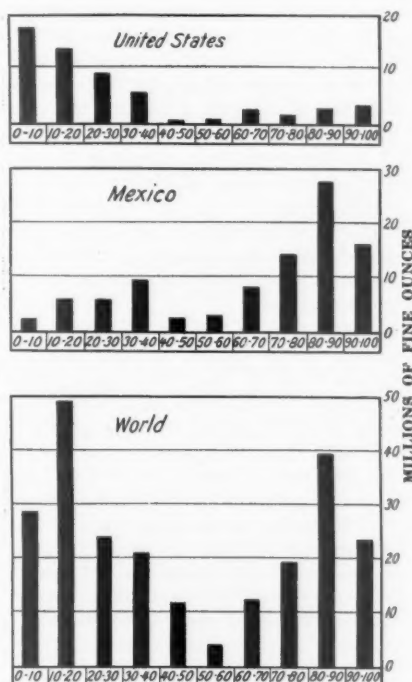


FIGURE 1

Silver production from argentiferous ores classified by percent of value contributed by silver

SALIENT FEATURES

1. Over one-half of the world's production of silver is from ores that derive less than 40 percent of their recoverable value from silver. Almost one-third is from ores carrying not more than 20 percent of their value in the form of silver.
2. One-third of the world's silver production is from ores that derive over 70 percent of their value from silver.
3. Over one-half of the world's silver production may be considered by-product silver.
4. Over one-quarter of the world's silver production may be considered derived from "straight silver" ores, as that proportion is produced from ores depending on silver for over 80 percent of their recoverable value.
5. Ores valued at less than \$10 per ton, of which silver at 50 cents an ounce contributed over 50 percent of the value, produce one-fifth of the world's silver.
6. Eighty percent of United States silver is produced as a by-product, but in Mexico 46 percent of the silver production is from "straight silver" ores.
7. Revenue derived from by-product silver in low-silver ores is a more important factor in the profits of metal mines than is apparent by contrasting the values of the metals in the ore.
8. Silver-bearing ores which produce 91 percent of the world's silver also produce 85 percent of the world's gold, 69 percent of the lead, 66 percent of the copper, and 46 percent of the zinc.
9. Ores in which silver is the principal source of revenue provide 49 percent of the world's silver; those in which lead is the principal source of revenue, 24 percent of the world's silver; copper, 14 percent; zinc, 7 percent; gold, 5 percent; and tin, 1 percent.

other metal production, the extent to which its by-product nature will tend to maintain its production in spite of price, and the extent to which the production of other metals may be affected by the price of silver. In response to the need for an analysis of the metal revenue relations in the production of argentiferous ores, the output of about 1,000 mines producing 91 percent of the world's silver has been tabulated for study.

This study differs from most such analyses made in the past in that the classification of ores is not made on metallurgical differences but on a purely economic basis. Thus, argentiferous ores are classified as follows:

1. According to the relative importance of silver revenue to total ore revenue.
2. According to the principal revenue-producing metal in the ore.
3. According to the relative impor-

TABLE 1—PRODUCTION OF SILVER FROM VARIOUS CLASSES OF ARGENTIFEROUS ORE BY COUNTRIES

Percent of total value of ore contributed by silver	Ounces of silver produced	Total	Percent of total by countries						
			United States	Mexico	Canada	Peru	Australia	India	Others
0 to 10	28,477,310	12.3	7.6	0.9	0.5	0.7	0.1	0	2.5
10 to 20	48,840,572	21.0	5.9	2.5	2.8	.7	3.9	3.2	2.0
20 to 30	23,930,940	10.3	4.0	2.4	1.0	2.4	.1	...	.4
30 to 40	20,876,902	9.0	2.4	4.0	.4	2.0	0	...	.2
40 to 50	11,626,312	5.0	.2	1.0	0	2.4	0	...	1.4
50 to 60	3,881,488	1.7	.3	1.2	0	.1	.1	...	...
60 to 70	12,586,500	5.4	1.0	3.5	.6	0	...	...	.3
70 to 80	19,302,839	8.3	.6	6.2	1.4	.1	...	...	0
80 to 90	39,395,516	16.9	1.2	11.9	1.2	1.6	...	...	1.0
90 to 100	23,384,696	10.1	1.4	6.9	1.5	.3	...	...	0
Total	232,303,075	100.0	24.6	40.5	9.4	10.3	4.2	3.2	7.8

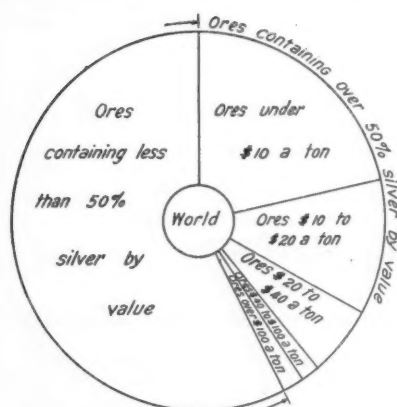


FIGURE 2

World production of silver from ores classified by total value of their recoverable metals

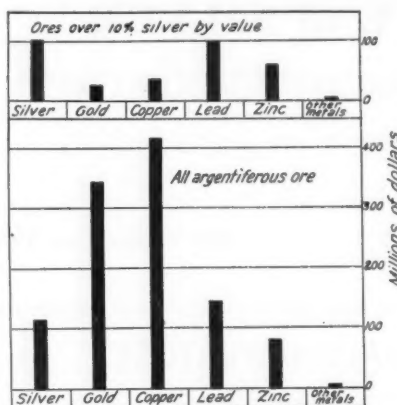


FIGURE 3

Production of metals (by value) from argentiferous ores



FIGURE 4

Production of silver classified by principal revenue-producing metal in the ores

TABLE 2—WORLD SILVER PRODUCTION FROM HIGH SILVER ORES CLASSIFIED ACCORDING TO THE PER TON VALUE OF THE ORE
(Silver figured at \$0.50 an ounce)

Percent of silver in ore by value	Silver produced, ounces	Percent of world total produced from ores of various grades					
		All grades	Under \$10 per ton	\$10 to \$20 per ton	\$20 to \$40 per ton	\$40 to \$100 per ton	Over \$100 per ton
50 to 60	3,881,488	1.7	0.2	0.6	0.2	0.6	0.1
60 to 70	12,586,500	5.4	.8	1.8	2.3	.5	0
70 to 80	19,802,889	8.8	5.8	.7	.2	.1	1.5
80 to 90	39,395,516	16.9	9.3	6.2	1.3	...	.1
90 to 100	28,884,696	10.1	5.3	2.2	2.1	.4	.1
Total	98,551,039	42.4	21.4	11.5	6.1	1.6	1.8

TABLE 3—SILVER PRODUCED FROM ORES IN WHICH SILVER CONTRIBUTES OVER 50 PERCENT OF THE REVENUE, CLASSIFIED ACCORDING TO THE PER-TON VALUE OF THE ORE AND BY COUNTRIES
(Silver figured at \$0.50 an ounce)

Country	Silver produced, ounces	Percent of world total produced from ores of various grades					
		All grades	Under \$10 per ton	\$10 to \$20 per ton	\$20 to \$40 per ton	\$40 to \$100 per ton	Over \$100 per ton
Mexico	69,009,112	29.7	19.7	4.5	4.5	0.6	0.4
United States	10,088,810	4.3	1.3	2.8	.2	...	...
Canada	11,058,457	4.8	.3	1.7	.9	.7	1.2
Peru	5,173,066	2.2	.1	1.2	.5	.2	.2
Others	3,271,594	1.4	...	1.3	...	.1	...
Total	98,551,039	42.4	21.4	11.5	6.1	1.6	1.8

TABLE 4—RELATIVE IMPORTANCE OF REVENUE DERIVED FROM METALS CONTAINED IN ARGENTIFEROUS ORES IN WHICH SILVER CONTRIBUTES VARIOUS PERCENTAGES OF THE TOTAL ORE VALUE

Class of ore silver content by value, percent	Total value of ore Dollars	Percent of total	Percent of total value contributed by various metals					
			All	Silver	Gold	Copper	Lead	Zinc
0 to 10	781,017,512	70.4	100.0	1.8	40.7	48.8	5.7	2.7
10 to 20	178,613,735	16.1	100.0	18.7	2.9	13.0	41.3	27.8
20 to 30	47,366,491	4.3	100.0	25.3	17.1	21.5	25.4	10.6
30 to 40	29,332,637	2.6	100.0	35.6	10.4	6.3	36.2	11.5
40 to 50	12,353,442	1.1	100.0	47.1	8.0	2.7	20.5	8.2
50 to 60	3,495,009	.3	100.0	55.5	20.7	6.8	16.5	.5
60 to 70	9,537,655	.9	100.0	66.0	23.7	1.9	4.7	1.3
70 to 80	12,457,466	1.1	100.0	77.6	18.0	.3	3.7	0
80 to 90	23,570,397	2.1	100.0	83.6	13.2	.4	1.3	.1
90 to 100	12,087,480	1.1	100.0	96.8	1.8	.1	1.3	0
0 to 100	1,109,831,824	100.0	100.0	10.5	31.0	37.6	13.1	7.2

TABLE 5—WORLD SILVER PRODUCTION FROM ARGENTIFEROUS ORES CLASSIFIED ACCORDING TO PRINCIPAL REVENUE-PRODUCING METAL AND BY COUNTRIES

Principal revenue-producing metal in ore	Silver produced, ounces	Per cent of world total by countries							
		World	Mexico	United States	Canada	Peru	Australia	India	Others
Silver	112,552,473	48.5	30.8	4.8	5.1	6.4	0.1	...	1.3
Lead	54,828,994	23.6	4.8	8.6	2.4	.3	4.0	3.2	.3
Copper	33,700,922	14.5	.7	6.8	.3	3.6	0	...	3.1
Zinc	15,320,100	6.6	2.4	3.6	.4	0	.1	...	.1
Gold	12,327,900	5.3	1.8	.8	1.2	0	0	0	1.5
Tin	3,572,686	1.5	...	...	...	...	...	...	1.5
Total	232,303,075	100.0	40.5	24.6	9.4	10.3	4.2	3.2	7.8

tance of silver revenue and that from any important associated metals.

The data upon which this article is based includes the metal production figures, where available, for every mine in the world producing argentiferous ore. The figures for the United States are for 1928; Mexico, 1926; Canada, 1927 and 1928; Peru, 1928; and for the various other countries from 1924 to 1929. These production data were reduced to the common denominator of value by using the following prices for the metals: Gold, \$20.67 a fine ounce; silver, 50 cents a fine ounce; copper, 18 cents a pound; lead, 6.6 cents a pound for United States mines and 5 cents a pound elsewhere; zinc, 6.4 cents a pound for United States mines and 5 cents a pound elsewhere; tin, the price actually received for the tin concentrates; cobalt, \$2.50 a pound; and nickel, 35 cents a pound. Thus it was possible to classify the production of argentiferous ores according to the relative importance of the metals contained.

The three following systems for the classification of argentiferous ores and the metal production therefrom have been employed:

1. According to the relative importance of silver revenue to total revenue derived from the ore. This system has resulted in 10 classes of ores: Those deriving 0 to 10 percent of their total recoverable value from silver; those deriving 10 to 20 percent of their total recoverable value from silver; and so on to a final class of ores carrying 90 to 100 percent of their recoverable value as silver. The production of gold, copper, lead, and zinc as well as silver has been tabulated under this system.

2. According to the metal providing the principal source of revenue. Under this system there are six classes of ores: Silver, lead, copper, zinc, gold, and tin.

3. According to classes based on the metals providing over 20 percent of the recoverable value of the ores with special



FIGURE 5

World production of silver from ores classified by metals contributing over 20 percent of their recoverable value. (Ore names based on arbitrarily chosen standards explained in text)

consideration given to the recoverable silver content of the ore.

Table 1 and Figure 1 give the production of silver classified by the proportion of total ore revenue derived from the silver in the ore.

The ores that produce the bulk of the world's silver are divided into two main groups—those deriving a relatively small proportion of their revenue from silver, and those depending almost exclusively on silver. Ores carrying not over 40 percent of their total recoverable value as silver account for over one-half of the world's silver and those deriving over 70 percent of their value from silver yield over one-third of the world's silver. This leaves less than one-eighth of the silver derived from ores depending on silver for 40 to 70 percent of their recoverable value.

A sharp contrast is seen between the type of ores yielding the bulk of the silver in the United States when compared with the most important silver ores in Mexico. Over one-half of the domestic production is from ores carrying less than 20 percent silver by value and over four-fifths is from ores carrying not over 40 percent silver by value. In Mexico almost two-thirds of the silver is derived from ores depending on silver for over 70 percent of their value.

It is the production from the ores that depend largely on silver for their value that are the most affected by silver price fluctuations. To determine accurately the effects of such price fluctuations, would require comprehensive cost data which is not made public by most producers. Some light is thrown on this subject, however, by classifying the high silver ores by the total recoverable value of the ore per ton, as has been done in Tables 2 and 3 and illustrated in Figure 2.

The importance of ores that contain less

TABLE 6—WORLD SILVER PRODUCTION FROM VARIOUS ORES CLASSIFIED BY THE PRINCIPAL METALS CONTAINED

Principal recoverable metals in ore (in % of total recoverable value)	Quantity of silver, fine ounces	Percent of total silver	Cumulative percent of total	Principal producing countries with their percent of total in each class
Silver: over 80%.....	62,780,212	27.02	27.02	Mexico 69% Canada 10% United States... 9% Peru 7% Others 5%
Silver: 50 to 80%.....	25,768,784	11.10	38.12	Mexico 87% United States... 10% Others 3%
Silver: under 20%.....	25,507,935	10.98	49.10	United States... 55% Peru 13% Others 32%
Silver: under 20%.....	25,083,924	10.80	59.90	Australia 36% United States... 26% Canada 23% Mexico 15%
Silver: 20 to 50%.....	24,925,534	10.73	70.63	Mexico 38% United States... 37% Peru 23% Others 2%
Silver: under 20%.....	15,880,094	6.84	77.47	India 47% United States... 38% Others 15%
Silver: 20 to 50%.....	8,113,906	3.49	80.96	Mexico 46% Others 54%
Silver: 20 to 50%.....	6,566,776	2.83	83.79	Peru 67% Others 33%
Silver: 20 to 50%.....	6,070,100	2.61	86.40	Peru 83% Others 17%
Silver: 50 to 80%.....	5,831,551	2.51	88.91	Canada 49% Others 51%
Silver: under 20%.....	4,275,094	1.84	90.75	United States... 81% Others 19%
Silver: 20 to 50%.....	3,820,528	1.65	92.40	
Silver: under 20%.....	3,686,460	1.59	93.99	
Silver: 20 to 50%.....	3,078,000	1.32	95.31	
Tin: over 20%.....	10,885,037	4.69	100.00	
Various	232,308,075	100.00	.....

TABLE 7—DISTRICTS PRODUCING OVER 1,000,000 OUNCES OF SILVER ANNUALLY

Rank	District or region	Year	Silver Production		Cumulative percent	Principal revenue-producing metal
			Fine ounces	Percent of world total		
1	Real del Monte, Hidalgo, Mexico.....	1928	13,746,000	5.35	5.35	Silver
2	Pachuca, Hidalgo, Mexico.....	1928	11,191,000	4.35	9.70	Do.
3	Summit Valley, Montana.....	1928	9,559,000	3.72	13.42	Copper
4	Coeur d'Alene, Idaho.....	1928	8,513,000	3.31	16.73	Lead
5	Broken Hill, N. S. W., Australia.....	1928	8,143,000	3.17	19.90	Do.
6	Bawdwin, Burma, India.....	1929	6,955,000	2.71	22.61	Do.
7	La Reforma, Hidalgo, Mexico.....	1928	6,763,000	2.63	25.24	Silver
8	Park City, Utah.....	1928	6,746,000	2.62	27.86	Lead
9	Fresnillo, Zacatecas, Mexico.....	1928	6,548,000	2.55	30.41	Silver
10	Tintic, Utah.....	1928	6,233,000	2.43	32.84	Lead
11	Santa Eulalia, Chihuahua, Mexico.....	1928	5,928,000	2.31	35.15	Do.
12	Colquijitca, Junin, Peru.....	1928	5,430,000	2.11	37.26	Silver
13	Fort Steele, B. C., Canada.....	1929	5,056,000	1.97	39.23	Lead
14	Cerro de Pasco, Junin, Peru.....	1928	5,039,000	1.96	41.19	Copper
15	Santa Barbara, Chihuahua, Mexico.....	1928	4,765,000	1.85	43.04	Lead
16	Cobalt, Ontario, Canada.....	1929	4,741,000	1.84	44.88	Silver
17	Casapalca, Lima, Peru.....	1928	4,344,000	1.69	46.57	Do.
18	Hidalgo del Parral, Chihuahua, Mexico.....	1928	4,108,000	1.60	48.17	Lead
19	Villa Escobedo, Chihuahua, Mexico.....	1928	3,752,000	1.46	49.63	Silver
20	West Mountain, Utah.....	1928	3,729,000	1.45	51.08	Copper
21	Mansfeld, Germany.....	1928	3,683,000	1.41	52.49	Do.
22	Mayo, Yukon, Canada.....	1928	3,304,000	1.29	53.78	Silver
23	Villa de la Paz, San Luis Potosi, Mexico.....	1928	3,229,000	1.26	55.04	Do.
24	El Chico, Hidalgo, Mexico.....	1928	3,049,000	1.19	56.23	Do.
25	Milluachachi, Libertad, Peru.....	1928	2,929,000	1.14	57.37	Do.
26	Yavapai County, Arizona.....	1928	2,619,000	1.02	58.39	Copper
27	Opoto, Sonora, Mexico.....	1928	2,602,000	1.01	59.40	Silver
28	Hostotipaquilla, Jalisco, Mexico.....	1928	2,527,000	.98	60.38	Do.
29	Guanajuato, Guanajuato, Mexico.....	1928	2,488,000	.97	61.35	Do.
30	Morococha, Junin, Peru.....	1928	2,479,000	.96	62.31	Copper
31	Sombrerete, Zacatecas, Mexico.....	1928	2,437,000	.95	63.26	Silver
32	Charcas, San Luis Potosi, Mexico.....	1928	2,392,000	.93	64.19	Zinc
33	Portland Canal, British Columbia, Canada.....	1929	2,374,000	.92	65.11	Gold
34	Rosario, Honduras, Central America.....	1928	2,287,000	.89	66.00	Silver
35	San Dimas, Durango, Mexico.....	1928	2,175,000	.85	66.85	Do.
36	Gowganda, Ontario, Canada.....	1929	2,077,000	.81	67.66	Do.
37	Angangueo, Michoacan, Mexico.....	1928	2,028,000	.79	68.45	Do.
38	Concepcion del Oro, Zacatecas, Mexico.....	1928	1,971,000	.77	69.22	Lead
39	Tlalpujahua, Michoacan, Mexico.....	1928	1,931,000	.75	69.97	Gold
40	Warren, Arizona.....	1928	1,916,000	.75	70.72	Copper
41	Tonopah, Nevada.....	1928	1,900,000	.74	71.46	Silver
42	Aramayo Mines, Bolivia.....	1927	1,722,000	.67	72.13	Do.
43	Bengkoelen, Netherland East Indies.....	1927	1,635,000	.64	72.77	Gold
44	Cusiuhirachi, Chihuahua, Mexico.....	1928	1,526,000	.59	73.36	Silver
45	Tepic, Guerrero, Mexico.....	1928	1,318,000	.51	73.87	Do.
46	Etzatlán, Jalisco, Mexico.....	1928	1,296,000	.50	74.37	Do.
47	Sierra Mojada, Coahuila, Mexico.....	1928	1,223,000	.48	74.85	Zinc
48	Shafter, Texas.....	1928	1,212,000	.47	75.32	Silver
49	Mazapil, Zacatecas, Mexico.....	1928	1,055,000	.41	75.73	Lead
50	Pioneer, Arizona.....	1928	1,043,000	.41	76.14	Copper

than \$10 in recoverable metals is evident from the tables, as is the importance of Mexico in the production of these high silver ores. Since the values of the ores are based on 50 cent an ounce silver it is seen that at present prices much of this production is either unprofitable or is but barely profitable.

The effect of silver price on the production of gold, copper, lead, and zinc has been the subject of much discussion. *Table 4* and *Figure 3* give the value of the metals derived from the argentiferous ores of the world.

The value of the total metal product of these ores exceeds a billion dollars and accounts for 91 percent of the world's silver, 85 percent of the gold, 69 percent of the lead, 66 percent of the copper, and 46 percent of the zinc. After eliminating the ores that carry less than 10 percent silver (see upper section of *figure 3*), the total metal product is equivalent to practically a third of a billion dollars of which a hundred million dollars are in silver. These ores account for 80 percent of the world's silver, 6 percent of the gold, 50 percent of the lead, 6 percent of the copper, and 34 percent of the zinc.

At first inspection it would appear that silver is of minor importance in the production of lead and zinc and of still less importance in the production of gold and copper. This, however, is not as much the case as it would seem because silver usually reaches the mixed bullion without added cost, and, except for very small refinery and marketing charges, may be accounted net profit. Thus the disregard of the silver content of most argentiferous ores would not reduce costs appreciably.

Silver production has also been classified according to the principal source of revenue in the ore from which it was derived. *Table 5* and *Figure 4* show the distribution of silver production by this method.

It will be noted that almost one-half of the world's silver production is from ores valued chiefly for silver. Ores valued chiefly for lead produce almost a quarter of the world's silver. Smaller quantities are derived from copper, zinc, gold, and tin ores. Mexico produces over half the silver derived from silver ores but the United States leads the world in the production of silver from the principal non-ferrous base metal ores—lead, copper, and zinc ores.

Under a third system of classification of silver production consideration has been given to each metal that contributes 20 per cent or more of the revenue derived from the ore. *Table 6* and *Figure 5* show the silver production of the world under this system.

This method of classification is parallel to the "one principal metal" system, but

segregates the more complex ores from the simpler ones. Thus ores containing important quantities of 3 or more metals are set up in separate classifications as argentiferous lead-zinc ores, etc.

The most important class of ores under this system is the straight silver (silver over 80 percent by value) class. Mexico produces over two-thirds of the world's silver that is derived from these ores. Next in importance are those ores that carry 50 to 80 percent silver and over 20 percent gold. Mexico produces 87 percent of this type of ore. The United States is the principal producer of the third most important class of ores—those carrying over 20 percent copper and less than 20 percent of any other metal. Of almost equal importance in point of silver production are the ores carrying over 20 percent lead, over 20 percent zinc, and less than 20 percent of any other metal, and the ores carrying from 20 to 50 percent silver and over 20 percent lead. Australia is the leading producer of silver from the former type of ore and the United States from the latter.

There are 50 districts in the world whose silver production exceeds 1,000,000 fine ounces annually. *Table 7* lists these 50 districts.

The total silver production from these 50 districts listed exceeds three-fourths of the world's total silver production. Silver is the principal source of revenue in only 4 of the leading 10 districts and in only 26 of the 50. Lead is the principal source of revenue in 11 districts, copper in 8, gold in 3, and zinc in 2. Four of the leading 10 are in Mexico, 4 in the United States, 1 in Australia, and 1 in India. Of the 50, 24 are in Mexico, 10 in the United States, 5 in Peru, 5 in Canada, 1 in Australia, 1 in India, 1 in Germany, 1 in Honduras, 1 in Bolivia, and 1 in the Netherland East Indies.

PROTECTING AND REGAINING TONNAGE

(From page 72)

letter received in the past few days from Clarence V. Bock, sales manager of the Lumaghi Coal Company, of St. Louis:

"I circularized the presidents of about 200 railroads with stoker propaganda last week and I believe 50 percent of them replied with a personal letter. I had a long letter from Mr. Powell, president of the C. & E. I., who is very much interested in this subject and is solicitous as to why we can not get more action on the domestic stoker.

"In my reply to his letter I suggested that he might like to talk to you. If you ever hear from him it might be a good scheme to simply tell him it is a case of bringing the matter squarely before the public with a lot of publicity and that the individual stoker companies as yet have not reached the point where they can afford a sufficient sum for advertising on a domestic stoker to put the idea over in a big way."

In conclusion, let me quote from the greatest of advertising mediums—the *Saturday Evening Post*:

"Take a good, unwishful, morning-after look at your product, your sales plan, yourself.

"Is the commodity you make and hope to sell, styled, finished, priced to present needs—if your market knew the facts about it would it sell itself?

"Is your selling energy out full limit, are your sales and advertising plans extraordinarily gauged to extraordinary resistances—or are you cutting the power just as you are trying to make the hill?

"About yourself, and this is more important than you might think; along with experience, imagination, judgment—have you a plenitude of plain old-fashioned nerve?"

We are vitally in need of a leader—some one man of wide vision, personal magnetism, a man *himself successful*, a man of large influence who will devote himself exclusively to securing the support of the National Coal Association, the Railway Executives Association, and the various industries represented by the Committee of Ten, to the end that funds averaging well over \$3,000,000 a year, and subscribed to for a period of 3 to 5 years, will be available, so that a nationally recognized advertising firm can take this problem in hand and do a real job of advertising. From the results obtained by others, we know in advance that satisfactory results are assured.

This is what we must do if we are going to do a real job of protecting our present *tonnage* and regaining our lost *tonnage*.

With the steady progress that has been made in the concentration of lead by flotation, products of increasingly richer grade ore are being produced. The question arises as to what extent concentration can be pushed and as to what are the factors limiting the richness of the lead products charged from the viewpoint of the lead smelter.

The Bureau of Mines is now working cooperatively with a smelter at Kellogg, Idaho, in order to obtain the answer to this question. By direct experimental methods it has been learned what happens when a charge comprised over one-half of lead is added as various compounds to the lead blast furnace. A similar investigation is also under way to learn what happens on sintering such a charge.

A set of four papers is in the press on the work done on "Smelting in the Lead Blast Furnace—Handling Rich Charges," the latter subtitle being used to distinguish this set from a previous one published as the result of similar investigations of the furnaces at Tooele, Utah, as already outlined in Reports of Investigations 2954, 2957, 2963, 2965, and 2966.

A GEOPHYSICAL SURVEY

on the SANTA RITA Ore Body

By L. H. Henderson*

IN THE past very little has been done to determine the practicability of geophysical methods of prospecting in the locating and outlining of large low grade deposits of disseminated sulphide mineralization. Geophysical prospecting as applied to mining, has been confined primarily to the locating of sulphite mineralization, essentially massive in occurrence, as this type of mineralization is more amenable to the majority of the various methods of prospecting.

Recently the Radiore Company, of California, conducted an experimental electrical survey on the Santa Rita ore body to determine the adaptability of a resistivity method to the prospecting of this type of deposit. This work was permitted by the courtesy of Mr. John

M. Sully, general manager of the Chino mines of the Nevada Consolidated Copper Company.

The survey was made in an area where the sulphide mineralization had been previously outlined by churn drilling. The geophysical work, however, was conducted independently and without knowledge of the drill-hole data. Upon the completion of the survey a geologic section through the area surveyed, and compiled from drill-hole data, was supplied by the Chino geology department for comparison with the electrical results. The aid given us by Mr. G. J. Ballmer, geologist for the Nevada Consolidated Copper Company, is gratefully acknowledged.

GEOLOGY

The Santa Rita ore body occurs in a

highly metamorphosed granodiorite porphyry stock, adjacent to this stock in badly fractured quartz diorite porphyry sills intruded into cretaceous and paleozoic sediments and to a lesser extent in these sediments.

Igneous metamorphism caused by the intrusion of the stock was extensive and subsequent mineralization in the stock of the adjoining rocks was rendered comparatively easy by virtue of the great amount of fracturing accompanying the intrusion.

In the mineral-bearing areas fracturing and faulting along both northeast and northwest directions has been extensive. The accompanying breaking up of the rocks allowed mineralizing and leaching solutions freer access and gave rise to very pronounced irregularities in the top of the sulphide zone. Vast

* Geological engineer; field engineer for the Radiore Company.

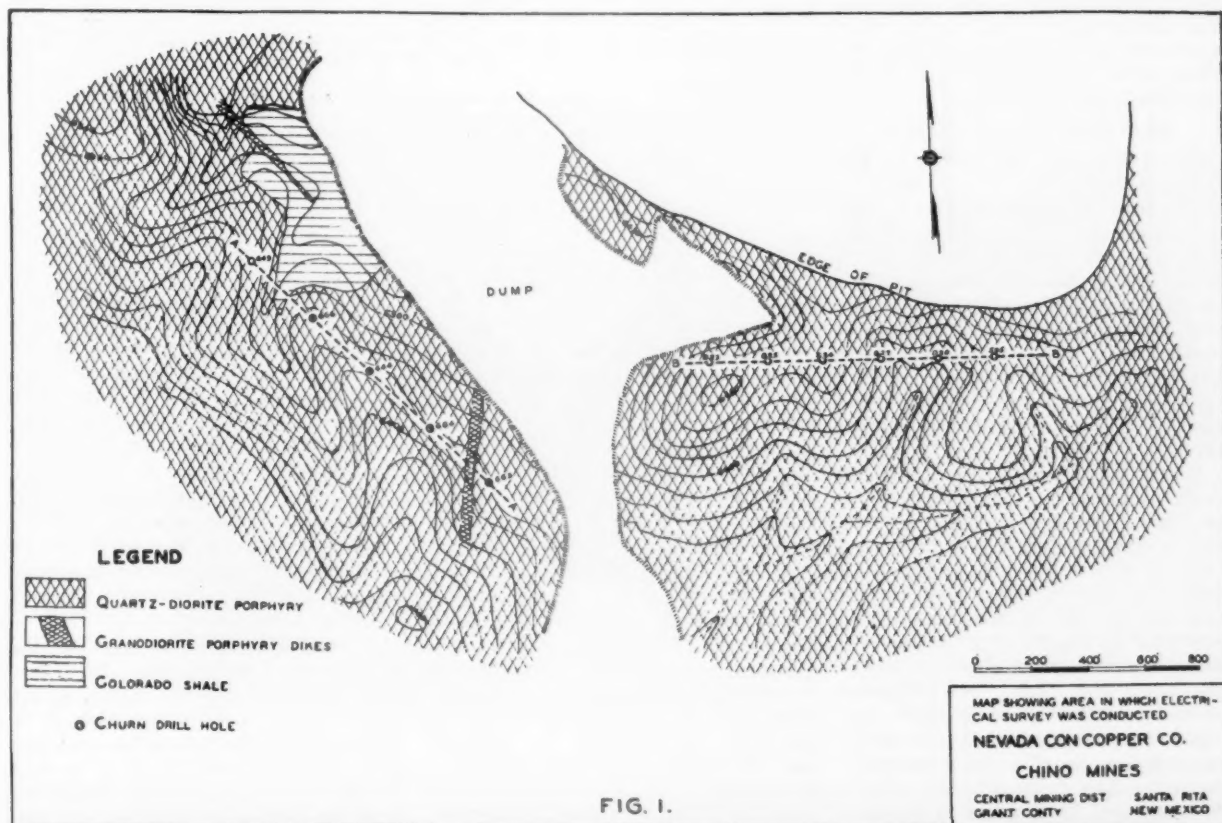


FIG. 1.

changes have been wrought by hydrothermal and meteoric agencies. Silicification, sericitization and kaolinization have been extensive.

The ore, though principally a disseminated one, carries a portion of the values in small seams and stringers. Leaching of the upper zone followed by secondary enrichment has made the mineralization one of economic import. Chalcocite is the principal ore mineral and occurs as a replacement of the pyrite.

A blanket of residual pyrite usually occurs immediately above the ore zone. This blanket varies from a few inches to more than 100 ft. in thickness and is very irregular in shape. Churn drilling has disclosed the total sulphide content to vary from a trace to more than 6.0 percent from the top of the sulphide zone down to the bottom of the ore. The ore varies from 0.8 percent and 2.0 percent, but as the chalcocite usually occurs at the expense of the pyrite, very little difference in total sulphide content is noted.

REMARKS

As pyrite and chalcocite are both excellent conductors of electricity and the chalcocite zone does not represent an appreciable increase in sulphides as compared with the sulphide content of the overlying pyrite blanket, it follows that a differentiation between the pyrite blanket and the chalcocite zone is not feasible electrically. The problem therefore resolved itself into one of outlining the blanket of residual pyrite which represents a zone of disseminated sulphide mineralization, averaging 4 percent total sulphide content.

BRIEF DESCRIPTION OF METHOD

The geophysical method used in this survey is known as a resistivity method—an electrical method which may be used for localizing mineralization by determining subsurface resistivity variations. As a basis of operation, this method depends upon (1) passing a current through the section of earth to be studied, and (2) determining the potential distribution of this current. Only a very brief description of this method and the principles involved will be given here.

In the procedure of the resistivity method a current is passed through the area to be studied by applying a potential between two electrodes ("Power electrodes") driven into the ground at a definite separation. The total current flow through this section of earth is measured by means of a milliammeter. Between the two power electrodes and in alignment with them, two additional electrodes ("Pick-up electrodes") are placed at a predetermined distance apart. The difference in potential existing between the two "pick-up" electrodes is then measured by means of a potentiometer especially designed for this type of work.

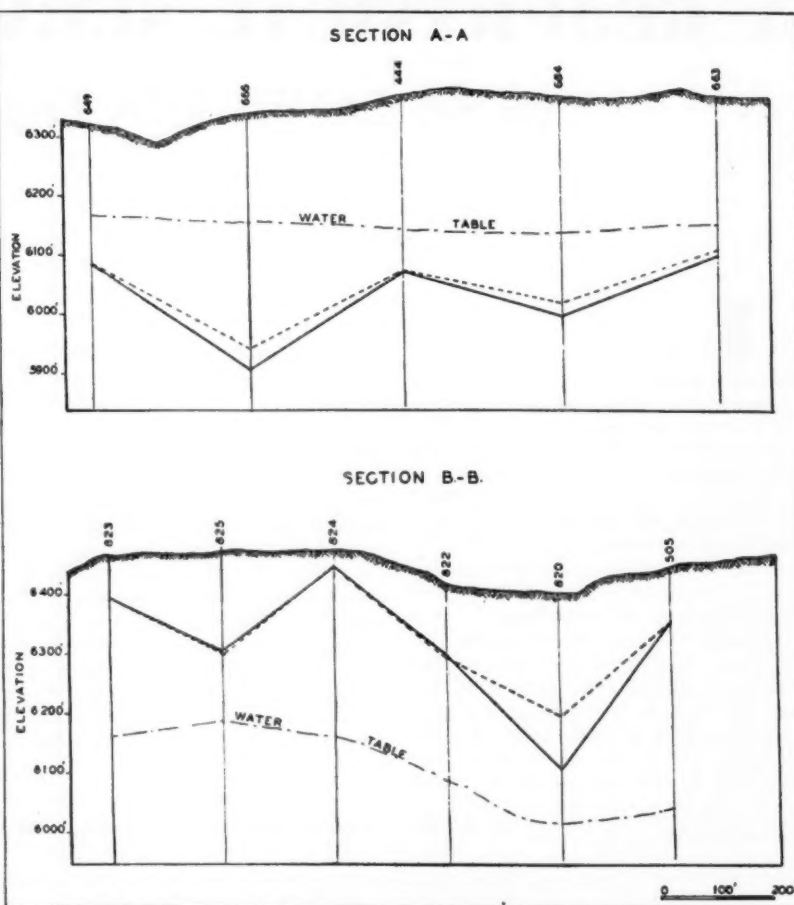


FIG. 2 SHOWING ELECTRICAL AND DRILL HOLE PROFILES OF DISSEMINATED SULFIDES

————— UPPER LIMIT OF DISSEMINATED SULFIDES ESTABLISHED BY DRILLING
 - - - - - UPPER LIMIT OF DISSEMINATED SULFIDES AS INDICATED BY THE
 GEO-ELECTRICAL SURVEY

NOTE POSITION OF WATER TABLE

meter especially designed for this type of work.

From the data thus obtained and by the use of a formula based upon a well-known law of electricity, the resistivity of a mass of subsurface material approximating a semi-cylinder in form, may be calculated. The length and radius of this semi-cylinder of earth is governed by the separation of the "pick-up" electrodes. The depth of the resistivity measurements then increases in direct proportion to the increase in the "pick-up" electrode separation.

The introduction of a highly conductive material into a medium of low conductivity, such as a rock formation, will result in a lower resistivity value for the latter. As the depth of the subsurface resistivity measurements is increased, any inclusion of a highly conductive material, such as the sulphides of most base metals, will result in a drop in resistivity

at the depth the mineralization is encountered. It is thus possible to locate very accurately, with respect to depth, any mineralized zones (zones of low resistivity) which may occur. It is also possible, by this method, to outline such zones—the accuracy of this function being largely dependent upon the size of the mineralized zone.

The field procedure depends largely upon the area to be surveyed and the problem involved, but in general a series of resistivity measurements are made along parallel lines (resistivity sections) covering the area.

A careful analysis is made of the field data and the resulting determinations correlated with the geology of the area under consideration, through a knowledge of the factors involved and practical field experience. It is then possible to arrive at definite conclusions as to the loca- (Continued on page 87)

LEGISLATIVE REVIEW

WITH sharp disputes and differences over the scope and extent of governmental relief to meet storm, drought and unemployment conditions, and acrid discussion over presidential appointments to the new Power Commission and the reorganized Tariff Commission, little headway has been made by Congress in disposing of the necessary business of its short session which began on December 1 last and which ends on March 4 next. The delay in the legislative program has been largely in the Senate, while the House has plodded faithfully along and disposed of a number of the necessary appropriation bills for the support of the Government for the year beginning July 1 next and a variety of miscellaneous bills.

Threats of an extra session of Congress after March 4 next are still in the air. The latest came from Senator Heflin, of Alabama, who declared that he was willing to tie up legislation at the short session in order to force an extra

session unless adequate relief measures were passed to meet the economic situation and the suffering reported in various parts of the country due to the drought, storms and unemployment. The conferees on the Muscle Shoals, Ala., nitrate and power project, contrary to earlier reports of a possible agreement, have failed to reach a conclusion on the matter and Senators Borah, of Idaho, and Caraway, of Arkansas, are demanding an extra session to settle this question, to regulate power rates, to consider legislation forbidding court injunctions in labor disputes and to consider railroad legislation, which latter has recently come to the fore in connection with a reported agreement of certain railroads to negotiate consolidations in the east.

A proposal to suspend immigration for two years, which had recently received the approval of the House Committee on Immigration, has been held up in view of opposition of Secretary of State

Stimson and Secretary of Labor Doak, who favor a 90 percent reduction in immigration instead. The committee has not yet reported the proposed measure pending further negotiations. Opposition to suspension of immigration has been expressed by Representative Dickstein, of New York, on the ground that the action will not relieve the unemployment situation, and is designed to ultimately check all immigration. The State Department has reported to the President that by strictly enforcing the present immigration law to prevent aliens from becoming public charges in this country, there has been a great reduction in the number of admitted aliens, and that during the year ending June 30, 1931, a total of 135,000 aliens, who otherwise might have been admitted, will not enter the United States.

The past month witnessed a number of committee changes due to deaths or resignations of members. Senator F. L. Greene, of Vermont, who previously had served in the House, died, and was succeeded by Senator F. C. Partridge, by appointment of the Governor, to serve until an election, March 31, to fill out the unexpired term ending March 4, 1935. Senator Partridge is president of the Vermont Marble Company. The death also occurred of Representative D. J. O'Connell, of New York, which will make the political line-up of the new House after March 4, as follows: Republicans, 218; Democrats, 214; Farmer Labor, 1; vacancies, 2. Sharp contests over the control of the Senate and House after March 4 will mark political conferences late in February because of the close division between the representatives of the two parties in both bodies. Senator Bratton, of New Mexico, was relieved from the Banking and Currency Committee to make way for Senator Morrison, of North Carolina, newly appointed, and Representative Kopp, of Indiana, resigned from the chairmanship of the House Committee on Labor to accept another committee chairmanship.

Agitation for a tariff duty on oil was revived by the holding of a conference in Washington, attended by representatives appointed by the Governors of oil producing states and by Congressmen favorable to a duty. It was contended by speakers at this conference that the depression in the American oil industry is not due to overproduction in this country but to imports from other countries. Senator Shortridge, of California, in favoring an oil duty, said the Senate could initiate the legislation by passing a bill to regulate the oil industry, in which could be included a provision for an oil tariff, without waiting on the House, which must originate revenue legislation, to act on the question.



The House debated but took no action on a long pending bill to create a division of safety in the Department of Labor. Advocates of the bill claimed that it would be largely beneficial to small manufacturers while the opponents asserted that the department already has authority to carry on work of promoting safety in industries.

Additional bills were introduced to suspend the performance of assessment work on mining claims, but no action has been taken on the matter. An investigation of the mineral resources under farm lands with a view to their utilization as a means of relieving the farm problem was advanced by Senator Thomas, of Oklahoma. The advocates of this proposal pointed out that outside of oil and gas, there are many other minerals underlying farm lands in commercial quantities throughout the country. By pooling these lands under adequate safeguards farmers could acquire a usable interest in the natural resources of the nation which he now owns but which he can not put to work. In many areas this might restore economic prosperity to the farmer and make him once more a firm and solvent foundation for our national economic structure. The pooling plan does not contemplate the farmer's entrance into the field occupied by the great drilling corporations who, in their activities, would simply lease from the cooperative pool instead of from the isolated individual. "Thoughtful leaders of the mining industry recognize that this is a more satisfactory, economical and orderly procedure than the present methods which require isolated bargaining with uninformed individual landowners whenever drilling blocks are to be formed," said a statement of a farm organization. It was stated that in a single year minerals produced in Oklahoma were of greater value than all agricultural products by \$100,000,000 and were equal to nearly half the entire appraised value of all farm lands in the state. The farm organization further stated:

"It is recognized by petroleum appraisal engineers that subsurface rights in potential mineral bearing lands gain greatly in per-acre value merely by virtue of being held in a large diversified spread under common ownership. The farmers' pooling plan does for the landowner what the lease-pooling plan does for the oil operator—substitutes a sound business principle for a gambling risk. The plan is the application of the principle of the investment trust to mineral resources and is not of sectional advantage to the farmers of the southwest but can be applied by farm organizations in many sections of the country. Under its present individual ownership mineral acreage is a frozen asset to most farmers. There are in this nation 1,105,454,459 acres in which new oil fields may be found as compared with 827,790,752 acres in areas unfavorable

for oil production. These favorable areas are scattered from coast to coast and from north to south.

"Figures of the Geological Survey and others list the likelihood of the occurrence of oil in all but 12 states while in some of these the lack of figures is due to the incomplete nature of geological data. By assembling this acreage in statewide pools the farmer figuratively extends the point of his plow to the development of his subsurface acreage. Drilling corporations which would place no value upon isolated tracts of unknown potential mineral value place substantial per acre value on these same tracts when they represent a part of a million acre spread. The farmer who holds a certificate of ownership to an undivided acreage interest in such a spread, in effect brings his mineral rights to the surface in the form of a tangible stock certificate with a recognized market value on which he should be able to borrow money for current pressing needs, sell at the increasing values known to accrue to well selected natural resources, or hold as a trust estate for future income from lease and production revenues."

Other bills introduced during the month provide for a duty on copper, an investigation of the administration of oil shale lands, an embargo against the importation of petroleum, to mark imported petroleum with the country of its origin, for mineral and other investigations in Alaska at a cost of \$250,000 to develop tonnage for the Alaskan Railroad, authorizing prospecting permits and leases to lands containing asphalt, gilsonite, elaterite and other like substances, subjecting minerals produced on certain Indian lands in Oklahoma to Federal and state taxes, and to forbid the entry of convict made goods.

Carrying out the President's recommendation for an investigation of the anti-trust law, Representative Graham, of Pennsylvania, proposed an investigation by the Judiciary Committee, of which he is chairman, as to the power of Congress to render advisory opinions as to whether or not submitted commercial contracts or agreements affecting interstate commerce are or are not violative of the anti-trust law.

The following is a summary of legislation before Congress during the past month:

H. R. 15549. Mr. Douglas (Dem., Ariz.), and H. R. 15550, Mr. Evans (Dem., Mont.). These bills propose to suspend the annual assessment work on mining claims for the years ending July 1, 1931 and 1932. Mines and Mining.

MINE CLAIMS

S. Res. 377. Mr. Thomas (Dem., Okla.). This resolution authorizes the Department of Agriculture to investigate the mineral resources of the country as related to farm lands, both as to the extent and as to the value of such resources as a farm asset, and to report such findings and recommend legis-

lation deemed practicable and desirable to encourage cooperation among farmers with a view to the more efficient use of such resources as assets. Agriculture.

H. R. 15430. Mr. Evans (Dem., Mont.). This bill proposes a duty of two cents per pound on imported copper. Ways and Means.

S. Res. 379. Mr. Walsh (Dem., Mont.). This resolution proposes an inquiry into the administration of the oil shale lands. It provides as follows:

WHEREAS it has been recently charged in the public press upon the authority of a former employe of the Government of reputed good character, long in the service of and charged with the duty of inquiring into the circumstances attending the disposition of the public lands, that considerable areas of such, valuable potentially and otherwise because of the oil shales in which they abound, have been improvidently, erroneously, and unlawfully, if not corruptly, transferred to individuals and private corporations, to the great loss of the public:

Resolved, That the Committee on Public Lands and Surveys is authorized and directed to inquire into the charges and into the alienation of oil shale lands of the United States, so far as they have been alienated and to the practices, rulings, and action of the Department of the Interior in relation to the preservation or disposition of such lands, or of applications for patent to the same, and to make such recommendations as to it may seem appropriate touching needed legislation or other governmental action for the recovery of any such lands as may have been wrongfully alienated or for a review of any final award by the Secretary of the Interior of any such lands. Public Lands.

H. J. Res. 446. Mr. McKeown (Dem., Okla.). This resolution would authorize the President to lay an embargo for such time as he deems necessary, against the importation of crude and refined oil in the United States when such importation threatens the destruction of the domestic oil industry in this country. The resolution states that the importation of crude and refined oil has "disturbed orderly progress of the domestic oil industry to the point where its destruction is imminent." Ways and Means.

H. R. 15611. Mr. Hope (Rep., Kans.). This bill would require the marking of the country of origin on imports of crude petroleum and refined products, including those manufactured in the United States from the imported oil. Ways and Means.

H. R. 15258. Mr. Carter (Rep., Wyo.). This bill opens to exploration and purchase under the act of May 10, 1872, minerals, except oil, oil shale, gas, phosphate, sodium and coal, in a certain described territory in Wyoming. Public Lands.

S. 5466. Mr. King (Dem., Utah). This bill appropriates \$10,000 for fuel research by the Bureau of Mines at its experiment station at Salt Lake City, Utah. Appropriations.

Mr. Smoot (Rep., Utah), introduced an amendment to the Department of Commerce appropriation bill for the year beginning July 1, 1931, providing \$5,000 for fuel research by the Bureau of Mines at its experiment station at Salt Lake City, Utah. Appropriations.

Mr. Howell (Rep., Nebr.), introduced an amendment to the Interior Department appropriation bill for the same year, providing that \$250,000 of the allotment to the Alaskan Railroad shall be available for investigation of mineral and other resources in Alaska to ascertain potential resources available for tonnage for the railroad. Adopted by the Senate.

S. 5563. Mr. Ransdell (Dem., La.). This bill authorizes a patent to a tract of land in Louisiana to Judson M. Grimmet, of Caddo Parish, La., if the Interior Department decides that the lands are neither mineral in character nor valuable for deposits of oil or gas. Public Lands.

MINERAL LEASES

H. R. 14248. Mr. Colton (Rep., Utah). This bill authorizes prospecting permits and leases to lands containing asphalt, gilsonite, elaterite or other like substances. Reported by the House Committee on Public Lands.

S. 2231. This bill provides for the purchase of additional land for enlargement of the Papago Indian reservation in Arizona, but makes the land available for disposition under the mining laws. Passed by the Senate and House.

S. Res. 387. Mr. Ashurst (Dem., Ariz.). This resolution requests the President to negotiate with Mexico for the purchase of 10,000 square miles in Lower California, comprising part of the State of Sonora. Foreign Relations.

S. 5553. Mr. Thomas (Dem., Okla.), and H. R. 15772, Mr. Hastings (Dem., Okla.). These bills provide that minerals, including oil and gas, produced after April 26, 1931, from restricted allotted lands of the Five Civilized Tribes of Indians in Oklahoma or from inherited restricted lands of Indian heirs or devisees of such lands, shall be subject to state and Federal taxes the same as those produced from lands owned by other citizens of Oklahoma. The act is not to be construed to impose or provide for double taxation and, in those cases where the machinery or equipment used in producing oil or other minerals on restricted Indian lands are subject to the ad valorem tax of Oklahoma for the year ending June 30, 1931, the gross production tax which is in lieu thereof shall not be imposed prior to July 1, 1931. Indian Affairs.

H. R. 12094. This bill proposes to grant certain lands in Alabama to the State of Alabama for vocational and other educational uses, with a reservation to the Government of the gas, oil,

coal or other mineral deposits, and the right to prospect and mine them. Passed by the House.

H. R. 13547. This bill provides that where a special-use permit to use for other than pasture purposes a tract of national-forest land not exceeding 160 acres has been issued under regulations of the Secretary of Agriculture, the land so rented shall not be subject to appropriation, entry, alienation, or adverse use or occupancy unless such permit is discontinued or revoked. Passed by the House.

S. 5604. Mr. Johnson (Rep., Calif.). This is similar to the foregoing. Agriculture.

S. 5586. Mr. Hayden (Dem., Ariz.). This bill proposes to establish a national monument area in the Navajo Indian Reservation in Arizona, covering 83,840 acres, but reserves to the Indians their title to the mineral rights in the land. Indian Affairs.

H. R. 16156. Mr. Hardy (Rep., Colo.). This bill proposes to amend the act of 1922 providing for the consolidation of national forest lands, so as to include in national forests any suitable lands in Colorado within six miles of a national forest. Public Lands.

S. Res. 305. Mr. Glass (Dem., Va.). This resolution would forbid the State Department from expressing approval or disapproval of foreign investment loans in the United States. Banking and Currency.

H. R. 15610. Mr. Evans (Rep., Calif.). This bill proposes to coin 500,000 silver 50 cent pieces in commemoration of the 150th anniversary of the founding of the city of Los Angeles. Coinage.

S. 5677. Mr. Swanson (Dem., Va.). This bill proposes to manufacture and sell 500,000 medals in commemoration of the 150th anniversary of the inde-

pendence of the United States. Library.

H. R. 15607. Mr. Williamson (Rep., S. Dak.). This bill proposes to forbid the importation of manganese and other products from Russia. Ways and Means.

H. R. 16035. Mr. Williamson (Rep., S. Dak.). This bill would prohibit the importation of any merchandise from Russia. Ways and Means.

H. R. 15597. Mr. Knutson (Rep., Minn.). This bill would forbid the entry into the United States after April 1, 1931, of any commodity which is mined, produced, transported, handled, loaded or manufactured wholly or in part in any foreign country by convict, forced or indentured labor. Ways and Means.

H. R. 15927. Mr. Kendall (Rep., Pa.). This is similar to the foregoing. Ways and Means.

S. 5370. Mr. Steiwer (Rep., Oreg.). This is similar to the foregoing. Finance.

ANTI-TRUST INQUIRY

H. Res. 322. Mr. Graham (Rep., Pa.). This resolution authorizes the House Committee on Judiciary to conduct an inquiry into the power of Congress to establish an administrative tribunal, with authority to render advisory opinions as to whether or not submitted commercial contracts or agreements affecting interstate commerce are or are not violative of the Anti-trust Act, and the advisability of the adoption of such a policy, and to report legislative recommendations. Rules.

S. 5513. Mr. Nye (Rep., N. Dak.). This bill proposes to authorize the Federal Trade Commission to hear and punish complaints as to alleged unfair trade practices, of which the following are listed:

Where any producer, manufacturer, dealer, or other person engaged in the purchase, sale, or resale of goods, wares, or other commodity, sells, offers, or advertises to sell any such article or articles of merchandise or commodity below cost price, or without profit, as a trade incentive or inducement tending to injure a competitor or competitors, or by any other means which clearly vitiates the fair trade practice rules approved by the Federal Trade Commission.

Where any party to any agreement approved by the Federal Trade Commission in respect to the production, distribution, sale, or other disposition of natural, manufactured, or other products and subject to interstate commerce regulations, which agreement, arising from any trade-practice conference authorized by the Federal Trade Commission, is alleged to have been violated by any party or parties thereto, or whose business has been materially injured by any competitor engaged in a similar line of trade.

Where any producer, manufacturer, or corporation engaged in interstate and foreign commerce uses or causes to be used any material either of domestic or foreign origin, to the injury of any individual or corporation engaged in the production and (Continued on page 87)





F. Campbell, vice president and general manager of the Old Ben Coal Corporation, is district chairman for the Illinois-Indiana group; Mr. Thomas G. Fear, general manager of operations, Consolidation Coal Company, district chairman for the Pennsylvania (bituminous),

R. E. Taggart, vice president, Stonega Coke and Coal Co., who is chairman of the Program Committee

DISTRICT CHAIRMEN OF THE PROGRAM COMMITTEE

COAL CONVENTION

West. Members of the Program Committee are as follows:

PROGRAM COMMITTEE

National Chairman

R. E. Taggart, vice president, Stonega Coke & Coal Company, Philadelphia.

ILLINOIS-INDIANA DISTRICT

District Chairman: George F. Campbell, vice president and general manager, Old Ben Coal Corporation, Chicago.

Paul Weir, vice president, Bell & Zoller Coal & Mining Company, Chicago; J. D. Zook, president and commissioner, Illinois Coal Operators Labor Association,



E. H. Suender



Milton Fies



George F. Campbell

THE week of May 11, 1931, will be an interesting one for the producers of coal. The American Mining Congress has announced this date as the time for its annual convention of practical operating men for the coal industry and the National Exposition of Coal Mine Equipment. This convention and exposition have been held annually for the past eight years and have become the foremost meeting of this type in the country.

The program is under the direction of Mr. R. E. Taggart, vice president of the Stonega Coke and Coal Company. He is having the cooperation of an industry-wide committee and is ably assisted by it and the district chairmen. Mr. George

Northern West Virginia and Ohio group; Mr. Milton H. Fies, vice president of the DeBardeleben Coal Corporation, district chairman for the southern group; Mr. P. C. Graney, general manager of the C. C. B. Smokeless Coal Company, district chairman for the Southern West Virginia, Virginia, Eastern Kentucky and Tennessee group; Mr. E. H. Suender, general manager of Anthracite Collieries, Madeira, Hill & Company, district chairman for the anthracite group; Mr. V. C. Robbins, chief engineer of the McAlester Fuel Company, district chairman for the Oklahoma and mid-western group; and Mr. W. D. Brennan, president and general manager of the Utah Fuel Company, district chairman for the Far

Chicago; G. C. McFadden, assistant vice president, Peabody Coal Company, Chicago; T. C. Mullins, president, Sunlight Coal Company, Chicago; G. E. Lyman, general superintendent, Madison Coal Corporation, Glen Carbon, Ill.; H. H. Taylor, Jr., Franklin County Coal Company, Chicago; F. S. Pfahler, vice president and general manager, Superior Coal Company, Gillespie, Ill.; W. J. Jenkins, president, Consolidated Coal Company of St. Louis, St. Louis; W. F. Davis, president, St. Louis & O'Fallon Coal Company, St. Louis; C. J. Sandoe, vice president, West Virginia Coal Company of Missouri, St. Louis; Charles W. Gottschalk, Big Vein Coal Company, Evansville, Ind.; Hugh Shirkie, Shirkie Coal

PLANS MATURE RAPIDLY

Company, Terre Haute, Ind.; P. L. Donie, Linton Coal Company, Linton, Ind.; C. J. Fletcher, Old Knox Manufacturing Company, Indianapolis; C. T. Hayden, general manager, O'Gara Coal Company, Chicago.

ANTHRACITE DISTRICT

District Chairman: E. H. Suender, general manager, Anthracite Collieries, Madeira, Hill & Company, Frackville, Pa.

T. D. Lewis, general superintendent, Lehigh Navigation Coal Company, Lansford, Pa.; R. E. Hobart, mechanical superintendent, Lehigh Navigation Coal

P. C. Thomas, general manager of mines, Koppers Coal Company, Pittsburgh; Dr. L. E. Young, vice president, Pittsburgh Coal Company, Pittsburgh; R. M. Shepherd, president, Allegheny River Mining Company, Kittanning, Pa.; E. J. Newbaker, general manager, Berwind-White Coal Manufacturing Company, Windber, Pa.; Albert L. Hunt, general superintendent, Pennsylvania Coal & Coke Corporation, Cresson, Pa.; T. R. Johns, general manager of coal mines, Bethlehem Mines Corporation, Johnstown, Pa.; A. J. Musser, vice president and general manager, Clearfield Bituminous Coal Corporation, Indiana, Pa.;

Clay, assistant general manager, Wheeling & Lake Erie Coal Company, Cleveland; H. L. Warner, general manager, Kanawha & Hocking Coal & Coke Company, Cleveland; E. J. Christy, construction engineer, The Wheeling Township Coal Mining Company, Adena, Ohio; William Emery, Jr., president, The Cambridge Collieries Company, Cleveland; W. J. Heatherman, National Fuel Company, National, W. Va.

SOUTHERN WEST VIRGINIA-VIRGINIA-EASTERN KENTUCKY-TENNESSEE DISTRICT

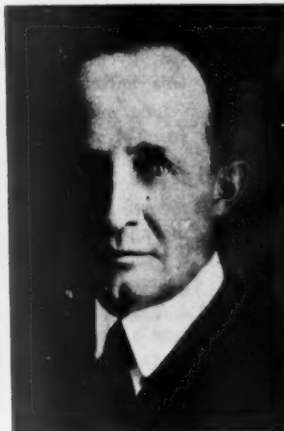
District Chairman: P. C. Graney, general manager, C. C. B. Smokeless Coal Company, Mt. Hope, W. Va.



P. C. Graney



V. C. Robbins



W. D. Brennan



Thomas G. Fear

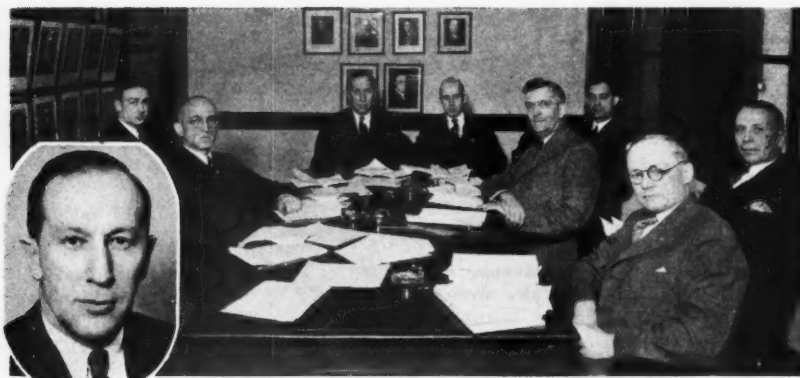
Company, Lansford, Pa.; A. M. Fine, vice president, Hudson Coal Company, Scranton; Cadwallader Evans, Jr., general manager, Hudson Coal Company, Scranton; A. B. Jessup, vice president, Jeddo-Highland Coal Company, Jeddo, Pa.; Paul Sterling, mechanical engineer, Lehigh Valley Coal Company, Wilkes-Barre; D. Ingersoll, The Pittston Company, Scranton; Joseph Mayers, general superintendent, Scranton Coal Company, Scranton; B. H. Stockett, general manager, Weston Dodson Company, Minersville, Pa.

PENNSYLVANIA (Bituminous)-NORTHERN WEST VIRGINIA-OHIO DISTRICT

District Chairman: Thomas G. Fear, general manager of operations, Consolidation Coal Company, Fairmont, W. Va.

Newell G. Alford, Pittsburgh; C. W. Gibbs, general manager, Harwick Coal & Coke Company, Pittsburgh; D. D. Dodge, general superintendent, W. J. Rainey, Inc., Uniontown, Pa.; W. P. Vance, general superintendent, Butler Consolidated Coal Company, Butler, Pa.; J. J. Geary, general superintendent, Monessen Coal & Coke Co., Alicia, Pa.; A. R. Pollock, general manager, Ford Collieries Company, Curtisville, Pa.; Ezra Van Horn, general manager, Clarkson Coal Mining Co., Cleveland; William P. Cayton, president, Rail & River Coal Company, Leader Building, Cleveland; A. B. Kelley, general manager, Humphreys Coal & Coke Company, Greensburg, Pa.; F. B. Dunbar, general superintendent, Mather Collieries, Mather, Pa.; M. D. Cooper, division general superintendent, Hillman Coal & Coke Company, Pittsburgh; R. V.

H. B. Husband, general manager, Chesapeake & Ohio Railway Company, Dorothy, W. Va.; H. S. Gay, Jr., general superintendent, The Gay Coal and Coke Company, Mt. Gay, W. Va.; H. D. Smith, assistant to president, Ashland Coal & Coke Company, Bluefield, W. Va.; Charles W. Conner, general superintendent, American Rolling Mill Company, Nellis, W. Va.; J. W. Bischoff, general superintendent, West Virginia Coal & Coke Company, Omar, W. Va.; J. D. Rogers, general manager, Stonega Coke and Coal Company, Big Stone Gap, Va.; George T. Stevens, managing engineer, Clinchfield Coal Corporation, Dante, Va.; Thomas H. Clagett, chief engineer, Pocahontas Coal & Coke Company, Bluefield, W. Va.; C. A. Griffith, vice president in



Meeting of the Program Committee in Washington

charge of operations, Pruden Coal Company, Pruden, Tenn.; L. C. Skeen, general superintendent, Fordson Coal Company, Stone, Ky.; L. B. Abbott, division engineer, Consolidation Coal Company, Jenkins, Ky.; T. E. Jenkins, vice president, West Kentucky Coal Company, Sturgis, Ky.

SOUTHERN DISTRICT

District Chairman: Milton H. Fies, vice president, DeBardeleben Coal Corporation, Birmingham, Ala.

D. A. Thomas, president, Montevallo Coal Mining Company, Birmingham; C. E. Abbott, vice president, Tennessee Coal, Iron & Railroad Company, Birmingham; J. A. Long, general manager, Woodward Iron Company, Woodward, Ala.; C. P. Moore, general manager, Pratt Fuel Corporation, Birmingham.

WEST-CENTRAL DISTRICT

(Arkansas-Oklahoma-Kansas-Missouri-Iowa)

District Chairman: V. C. Robbins, chief engineer, The McAlester Fuel Company, McAlester, Okla.

K. A. Spencer, charge of engineering, Pittsburg & Midway Coal Mining Company, Pittsburg, Kans.; Ira Clemens, Commercial Fuel Company, Pittsburg, Kans.

FAR WEST DISTRICT

(Colorado-Utah-Montana-Wyoming-New Mexico-Washington)

District Chairman: W. D. Brennan, president and general manager, Utah Fuel Company, Salt Lake City.

D. A. Stout, chief engineer, Colorado Fuel & Iron Company, Pueblo, Colo.; F. W. Whiteside, mining engineer, Victor-American Fuel Company, Denver; S. Tescher, general superintendent, National Fuel Company, Denver; F. A. Sweet, president and general manager, Standard Coal Company, Salt Lake City; I. N. Bayless, Union Pacific Coal Company, Rock Springs, Wyoming; Edward Bottomley, general superintendent, Sheridan-Wyoming Coal Company, Kleen-

burn, Wyoming; Gomer Reese, general superintendent, Kemmerer Coal Company, Frontier, Wyoming; E. P. Lucas, president, Bellingham Coal Mines, Bellingham, Wash.

District meetings have been held at Chicago, Pittsburgh, Huntington, Birmingham, and Scranton, Pa. The Midwest section and the Far West have furnished the chairman of the committee with questionnaires outlining their desires, and the result is one of the finest, liveliest programs ever presented at this convention.

The unanimous decision of operators from every district is that the topic uppermost in the minds of the industry is safe operating practices. Safety from face to tippie, training men, and enforcing and maintaining discipline have been assigned prominent places on the program.

A final meeting of the Program Committee was held in Washington, D. C., at the headquarters of the American Mining Congress, when the wishes of each district were considered. As the result of this meeting, the program on the following pages was outlined.

THE NATIONAL EXPOSITION OF COAL MINE EQUIPMENT

The Manufacturers Division of the American Mining Congress will hold its annual exposition in conjunction with the convention. Mr. Fred J. Maple, advertising manager of the John A. Roebling's Sons Company, is chairman of the board of governors of this division, and has recently announced to the industry that on January 24, 1931, fully 85 percent of all available space at the exposition has been assigned to manufacturers applying for exhibit space. Such an announcement is encouraging and amazing. It is quite apparent that an extraordinarily fine exhibition is already assured. Everything in the line of mining equipment will be on display, and many new and novel features will be introduced.

Special effort is being made by the Program Committee and the Manufac-

turers Division to bring into this year's meeting and exhibit the Stoker Manufacturer. A place on the program has been assigned to practical fuel utilization. There will be no technical discussions. The operators expressed a very great wish to be better informed as to just how the domestic stoker can assist them in retaining present markets, in competition with oil and gas, and in developing new markets for their coal. The stoker exhibit would be largely an educational one, and would permit the men at the mine (the superintendent, the foreman, and others directly responsible for production) to get a better understanding of how the coal should be prepared to meet stoker requirements.

The Manufacturers Division is a cooperative group of companies furnishing equipment to the coal industry, and has sponsored these expositions for eight years. It is to be congratulated upon the excellent results of previous years, which is responsible for the very great interest being displayed this year.

The convention and exposition offer a remarkable opportunity. That it is being taken full advantage of is evidenced by the results of the 1930 meeting, when 90 percent of all of the coal produced in the United States was represented in the convention, and 128 manufacturers displayed equipment in 50,000 square feet of floor space.

Special arrangements are being made for entertainment, and at this early date there is every assurance that the attendance will be greater than in previous years, that the exposition will be larger, finer and more comprehensive, and that the results that will be obtained through the discussion of practical operating problems will be more valuable than ever before.

Remember the dates: May 11 to 15, inclusive. The place is Music Hall, Cincinnati, Ohio. The management is the American Mining Congress, an organization representing 87 percent of all of the minerals produced in the United States. The exposition will, as usual, be directly under the supervision of the Manufacturers Division. The program is sponsored by a most highly efficient group of operating men, Mr. Taggart and his committee representing approximately three-fourths of the coal produced in this country.

The Cincinnati local organizations are cooperating fully. The railroads have granted special rates to and from the convention. The local coal associations are assisting, and wide interest is evident. Mr. L. W. Shugg, of the General Electric Company (through the courtesy of his company) will again act as director of exhibits, and E. R. Coombes, of the Washington staff of the American Mining Congress, will have charge of the details of the convention.

TENTATIVE PROGRAM

8th ANNUAL CONVENTION PRACTICAL COAL OPERATING MEN

The American Mining Congress

Cincinnati, Ohio
May 11-15, 1931

MONDAY
MAY 11
11 A. M.

SCIENTIFIC ORGANIZATION

CHAIRMAN: GEO. W. REED
*Vice President, in Charge of Sales,
Peabody Coal Company*

(1) SCIENTIFIC MANAGEMENT FOR MINE
OPERATION

By P. C. THOMAS, *General Manager of Mines,
The Koppers Coal Company.*

DISCUSSION:

MONDAY
MAY 11
2 P. M.

SAFE OPERATING PRACTICE

CHAIRMAN: P. M. SNYDER
President, C. C. B. Smokeless Coal Company

(1) MAINTAINING DISCIPLINE

By THOMAS G. FEAR, *General Manager of Operations,
Consolidation Coal Company.*

DISCUSSION:

R. V. CLAY, *Wheeling & Lake Erie Coal Co.*
DR. L. E. YOUNG, *Pittsburgh Coal Co.*
I. N. BAYLESS, *Union Pacific Coal Co.*
D. A. STOUT, *Colorado Fuel & Iron Co.*
MILTON H. FIES, *DeBardeleben Coal Corp.*
A. R. POLLOCK, *Ford Collieries Co.*
EDW. WEIKEL, *Hudson Coal Co.*

(2) SAFETY PROGRAM AT ARMCO—Records,
Methods of Enforcement, etc.

By C. W. CONNER, *General Superintendent,
American Rolling Mill Co.*

TUESDAY
MAY 12
10 A. M.

MINING SYSTEMS

CHAIRMAN: D. D. MUIR, JR.
*Vice President and General Manager,
U. S. Fuel Company*

(1) CENTRAL PENNSYLVANIA

By M. D. COOPER, *Division General Superintendent,
Hillman Coal and Coke Co.*

(2) ILLINOIS-INDIANA DISTRICT

By GEO. F. CAMPBELL, *Vice President and General
Manager, Old Ben Coal Corporation.*

(3) SOUTHERN DISTRICT

By W. A. HAMILTON, *Tennessee Coal, Iron &
R. R. Co.*

(4) FAR WEST DISTRICT

By GEO. SCHULTZ, *General Superintendent,
Liberty Fuel Company.*

(5) OKLAHOMA DISTRICT

By

(6) STRIP MINING

By K. A. SPENCER, *Charge of Engineering,
Pittsburg and Midway Coal Mining Co.*

TUESDAY
MAY 12
2 P. M.

MECHANICAL MINING (Thick Seams)

CHAIRMAN: T. T. BREWSTER
President, Mt. Olive and Staunton Coal Company

(1) LOADING MACHINES

By E. J. CHRISTY, *Consulting Engineer, the
Wheeling Township Coal Mining Co.*

DISCUSSION:

J. C. NELMS, *Ohio & Pa. Coal Company.*
H. A. TREADWELL, *Chicago, Wilmington & Franklin
Coal Co.*

(2) MECHANICAL MINING AT STANDARD
COAL COMPANY

By EARL OLIPHANT, *Treasurer and General
Manager, Standard Coal Company.*

(3) GATHERING SYSTEM WITH MECHANICAL
MINING

By C. J. SANDOE, *Vice President, West Virginia
Coal Co. of Missouri.*

DISCUSSION:

CHAS. W. GOTTSCHALK, *Big Vein Coal Company.*
DAVID I. INGLE, *Ingle Coal Company.*

(4) MECHANIZED MINING AT CARBON FUEL
COMPANY

By C. A. CABELL, *Vice President, Carbon Fuel
Company.*

(5) MECHANICAL LOADERS IN THICK SEAMS

By E. C. MATTOX, *General Manager, Roundup
Coal Mining Company.*

WEDNESDAY
MAY 13
10 A. M.

ANTHRACITE

CHAIRMAN: S. D. WARRINER
Chairman of the Board, Lehigh Navigation Coal Co.

(1) ANTHRACITE RESEARCH FOR UTILIZA-
TION

By C. A. CONNELL, *Anthracite Service.*

(2) ROLLER BREAKER PRACTICE SUG-
GESTED BY NEW MARKET TREND

By PAUL STERLING, *Mechanical Engineer, Le-
high Valley Coal Company.*

- (3) PREPARATION OF ANTHRACITE FINES
By
- (4) ROCK MUCKING BY MACHINES
By RUSSELL L. SUENDER, *Madeira, Hill & Company.*
- (5) MECHANICAL MINING IN ANTHRACITE
By JOHN C. HADDOCK, *President, Haddock Mining Company.*

WEDNESDAY
MAY 13
2 P. M.

SAFE OPERATING PRACTICE

CHAIRMAN: THOMAS W. DAWSON
Vice President, H. C. Frick Coke Company

- (1) COST OF MINE ACCIDENTS
By R. M. LAMBIE, *Department of Mines of West Virginia.*
- (2) SAFETY AND MECHANICAL MINING
By W. J. JENKINS, *President, Consolidated Coal Co. of St. Louis.*
- (3) SAFETY AT THE FACE
By F. B. DUNBAR, *General Superintendent, Mather Collieries.*
- (4) SAFETY WITH CONVEYORS
By ALBERT L. HUNT, *General Superintendent, Pennsylvania Coal & Coke Corp.*
- (5) SAFETY WITH ELECTRICAL EQUIPMENT
By W. P. VANCE, *General Superintendent, Butler Consolidated Coal Company.*

THURSDAY
MAY 14
10 A. M.

MECHANICAL MINING (Thin Seams)

CHAIRMAN: H. L. WARNER
Warner Collieries Company

- (1) MECHANICAL MINING IN THIN SEAMS IN BIRMINGHAM DISTRICT
By MILTON H. FIES, *Vice President, DeBardeleben Coal Corp.*
- (2) CONVEYOR AND SCRAPER MINING IN THIN SEAMS
By T. F. MCCARTHY, *Clearfield Bituminous Coal Co.*
- (3) THIN SEAM MINING IN ARKANSAS
By V. C. ROBBINS, *Chief Engineer, The McAlester Fuel Company.*
- (4) MECHANICAL MINING AT THE STONEGA COKE AND COAL COMPANY
By J. D. ROGERS, *General Manager, Stonega Coke and Coal Company.*

DISCUSSION:
R. Y. WILLIAMS, *Weston, Dodson & Company.*

THURSDAY
MAY 14
2 P. M.

MAINTENANCE AND TRANSPORTATION

CHAIRMAN: C. F. RICHARDSON
President, West Kentucky Coal Company

- (1) BUDGETING REPAIR WORK
By B. H. MCCracken, *Consolidation Coal Company.*
- DISCUSSION:
H. C. Frick Coke Co.
- (2) MAIN LINE AND GATHERING
By NEWELL G. ALFORD, *Eavenson, Alford and Hicks.*
- DISCUSSION:
R. L. KINGSLAND, *Consolidation Coal Company.*
R. G. STEVENS, *Loup Creek Col. Company.*
- (3) HAULAGE AT THE W. J. RAINEY PROPERTIES
By D. D. DODGE, *General Superintendent, W. J. Rainey, Inc.*
- (4) CONVEYOR SLOPE INSTALLATION AND OPERATION
By DAVID INGLE, *President, Ingle Coal Company.*

FRIDAY
MAY 15
10 A. M.

FUEL UTILIZATION

CHAIRMAN: J. G. BRADLEY
President, Elk River Coal & Lumber Company

- (1) RESEARCH ON COAL FOR UTILIZATION
By JOHN ROSCOE TURNER, *President, University of West Virginia.*
- (2) DEVELOPMENTS IN COAL CLEANING
By HOWARD N. EAVENSON, *Eavenson, Alford & Hicks.*

DISCUSSION:
(Covering various systems of cleaning.)

FRIDAY
MAY 15
2 P. M.

RECENT DEVELOPMENTS IN MINING PRACTICE

CHAIRMAN: ERSKINE RAMSAY
Chairman of the Board, Alabama By-Products Corp.

- (1) CUTTING, DRILLING AND BLASTING
(Changes in cutting Machines, etc.)
By G. C. MCFADDEN, *Assistant Vice President, Peabody Coal Company.*
- (2) TREATING MACHINE BITS
By H. H. TAYLOR, JR., *Franklin County Coal Company.*
- (3) SUCCESSFUL HANDLING OF REFUSE
By F. S. FOLLANSBEE, *Chief Engineer, The Koppers Coal Company.*
- (4) STRIP MINING
By

GEOPHYSICAL
SURVEY

(From page 78)

AREA SURVEYED

The resistivity survey was conducted in the Estrella area which lies immediately to the southwest of the Chino pit. In this survey, 11 resistivity sections were taken along two separate lines of drill holes, arbitrarily chosen, with five holes in the first line and six in the second. The first line of drill holes strikes N. 45 degrees W. and includes drill holes 663, 684, 444, 666, and 649. The second line strikes due west and includes drill holes 505, 820, 822, 824, 825, and 823. The locations of these various holes are shown in *Figure 1*. The proximity of the N. 45 degree W. line to a dump and the E. W. line to the pit would not permit parallel or transverse sections to be taken in either instance.

RESULTS OBTAINED

Resistivity sections were taken along the two lines of drill holes at each respective hole. The various sections were taken to a depth of 500 feet in each instance, with subsurface resistivity measurements being made at a selected depth interval.

Upon the completion of the survey the field data was computed and carefully studied. The analysis of the field data revealed that two very definite anomalies were encountered with depth at each section, one of which was attributed to the water table and the other, which in each instance manifested a much greater magnitude, was attributed to sulphide mineralization. Based upon this interpretation profiles of the sulphide mineralization along each of the two lines of drill holes were made. These profiles were then submitted to the Chino Geology Department for comparison with the profiles compiled from the actual drill-hole data. These two sets of profiles are shown in *Figure 2*.

Everything considered, the two profiles compare very favorably. It will be seen that the electrical profile and the drill hole profile are identical in every instance with respect to the depths to crests or peaks in the disseminated sulphide mineralization, whereas, in the depressions or troughs, the electrical profile, in some cases, indicates the mineralization to be shallower than it actually occurs in the drill holes. The increase in subsurface material included with each successive resistivity measurement is such that as measurements were made over deep and narrow troughs in the upper limit of the mineralization, the surrounding peaks of sulphides were included, and the attendant drop in resistivity noticed before the depth to the trough was actually reached, thus giv-

tion of any sulphide mineralization which may be present.

ing rise to a slight inaccuracy in depth. This discrepancy can be eliminated to a large extent by taking parallel and transverse sections, but due to the time element involved, together with the obstacles offered by the proximity of the pit and a large dump, a more detailed survey was prohibitive at this time.

CONCLUSIONS

The results of this experimental survey are exceedingly gratifying from the commercial as well as from the research viewpoint. The ease and accuracy with which disseminated mineralization may be localized by the employment of geophysics would seem to establish beyond question an indispensibility for these methods in the prospecting and exploration of this type of mineralization. This is especially true in the case of secondary enriched deposits where a definite relationship exists between the ore zone and any residual sulphides which may be present—the total sulphide content may be as low as 2 percent.

A geophysical survey of this nature will not only make possible a profile similar to the ones in *Figure 2*, but the lateral limits of the mineralization may also be outlined by a more detailed survey, in which a system of parallel and transverse sections are made—thus furnishing a picture of subsurface conditions that can be obtained by no other means, as quickly and as economically.

LEGISLATIVE
REVIEW

(From page 81)

ufacture and sale of any article or articles therefrom for strictly domestic consumption.

Where any producer of domestic material is dependent upon transportation or other facilities owned or operated by individuals or corporations having a monopoly in such facilities and the unlawful power to fix prices and thereby discriminate or otherwise use such facilities to the injury of said producer so engaged in the production of commodity material for domestic consumption.

All parties in interest as above may be heard by said commission, sitting as a court of equity, or by any equity court previously constituted, in redress of grievances as a consequence of such violation, violations, or injury. And in any such proceeding the complainant or complainants shall file an itemized statement, under oath, of the amount of damages alleged to have been incurred as a result of such violation or injury which in effect is hereby held to restrain commerce.

On conviction the defendant shall be required to pay to the complainant punitive damages not to exceed three fold the amount alleged to have been incurred, and costs of the suit, including attorney fees. Judiciary.

S. 5593. Mr. Brookhart (Rep., Iowa). This bill would forbid railroad consolidations, except those extending from the

Atlantic to the Pacific coasts. Interstate Commerce.

S. 5594. Mr. Brookhart (Rep., Iowa). This bill authorizes the Interstate Commerce Commission to acquire and operate a railroad from the Atlantic to the Pacific coasts, through a Federal Railroad Corporation with \$1,000,000 capital. Interstate Commerce.

IMMIGRATION SUSPENSION

H. R. 15614. Mr. Almon (Dem., Ala.). This bill proposes a suspension of immigration to the United States for five years beginning July 1, 1931. Immigration.

S. 5648. Mr. King (Dem., Utah). This bill would confer upon district courts of the United States and the Supreme Court of the District of Columbia, jurisdiction over cases or controversies involving decisions of a judicial or quasi-judicial character of officers of the executive departments of the Government. Judiciary.

H. R. 15270. Mr. Lankford (Dem., Ga.). This bill proposes to establish under the Department of Agriculture a pine forest products laboratory in the naval stores section of the country. Agriculture.

S. 5500. Mr. Oddie (Rep., Nev.). This bill proposes the construction of an additional power plant at Lahontan Dam on the Newlands irrigation project at Fallon, Nev., for the generation of electrical energy at or below the dam. Irrigation.

H. R. 16215. Mr. Taylor (Dem., Colo.). This bill would authorize the sale under 25-year contracts of surplus power or power privileges should power development become necessary under the Grand Valley Reclamation project in Colorado. Irrigation.

H. J. Res. 448. Mr. Chindblom (Rep., Ill.); S. 5625. Mr. Deneen (Rep., Ill.). These bills would appropriate \$1,725,000 for Government participation in the World's Fair Centennial Celebration in Chicago in 1933. Library and Commerce.

H. R. 15266. Mr. LaGuardia (Rep., N. Y.). This bill would forbid the issuance by courts of injunctions in labor disputes. Judiciary.

H. R. 15269. Mr. LaGuardia (Rep., N. Y.). This bill proposes an unemployment relief plan under which every employed person in the United States over 21 years old would pay a tax of 5 cents a week while employed, and every employer, individual or corporate, a tax of 10 cents a week for each person employed by them. Benefits would be paid the unemployed in accordance with the cost of living by an employment commission. Ways and Means.

H. Res. 323. Mr. Black (Dem., N. Y.). This resolution would create a committee of 11 members of the House on economic (Continued on page 97)

ROOF ACTION in Pillar Recovery

By G. B. Southward

THE reason why roof action has a particular interest at this time is because of the changes which are being made or contemplated in the mining systems to suit the requirements of mechanized loading. The increased widths of working places, concentrated mining areas and the rapid rate of mining have introduced new factors to cause changes in the roof action from that formerly had in the older hand mining systems. In some cases this has been more favorable; in others just the reverse is true. It is not usually possible to predict what roof action may be had where modifications in the older plans are made, but this can frequently be indicated by a study of what takes place in the roof strata in the present pillar recovery methods with hand mining.

There have been a number of theories formed to describe the action that takes place in the overlying strata of a coal seam that is being mined to complete or nearly complete extraction. These theories are based on extensive observations which have been made over a period of years and are undoubtedly correct within limitations. That is to say, that no one single theory appears to fit all mines and it seems agreed that the character of the strata and the depth of cover influence the action and further that the method or system of mining the coal has much to do with what takes place in the overlying measures.

It is not the purpose of this article to discuss what takes place in the general overburden or on the surface, but to confine the consideration entirely to the known action at the working face of the strata immediately over the coal seam. This factor in the first analysis determines the economy of any mining method and it is in this particular point that our greatest interest lies at the present time. The action of the overburden will not be considered except incidentally as it may affect the roof at the working place.

There are two general methods of roof action—the caving and the subsiding. The subsidence method is confined entirely to long-wall workings and involves the use of built-up packs. This required a roof of sufficient flexibility to allow the strata to bend without breaking. The face is kept open continuously with the subsidence following behind as the area is mined out. This method is not used very extensively in the mines of the United States because the expense of building the packs is prohibitive.

In the caving method the breaks in the overlying measures which follow complete or nearly complete mining may take place in several phases or the complete action may all occur at one time. This is governed by the nature of the roof strata and the depth of the cover.

The width which any strata will span depends upon its strength as a beam and when an area is being mined a width is sooner or later reached where the strata over the coal does not have sufficient strength to span the opening made. When this occurs the beam will fail and the roof break will continue up through the rock over the coal until a stronger strata is reached which is capable of spanning the opening. This is usually

The typical roof actions in the standard methods of pillar recovery with hand mining illustrate principles which can be used in the design of new mining systems for mechanized loading.

termed the primary fall and its extent depends on the character and strength of the roof rock. As the mining progresses further and the width of the excavated area increases, this first action is repeated, but at that time the secondary falls or breaks occur in the upper strata and these continue higher until finally all of the upper measures will either have broken or subsided upon the fallen material underneath them.

This action, as just described, will take place in a mining area whose size is continually increasing, but it may not occur in the several phases just outlined. The nature of the strata governs this. In certain mines where the rock over the coal is comparatively weak, the primary and secondary fall will generally occur; other mines have an extremely strong top over the coal and a large area must be excavated before the strength of the rock is exceeded. In such a condition the primary break may extend up to the surface and the first fall will be complete without any secondary action.

The character of the strata immediately over the coal seam may be anything from soft slate or clay to a hard sandstone. The thickness of the rock which forms the mine roof also varies from a few inches to a number of feet.

While there are an infinite number of combinations of alternate layers of strong and weak strata which form the roof over the coal, in general we can divide the top into three broad classifications: (1) soft top which has little if any cohesive or beam strength; (2) fairly good top consisting of stratified layers, and (3) hard top of considerable strength and thickness.

The support required for a soft or weak roof is had by setting a sufficient number of posts or cross-bars to support the weight. This is illustrated in *Figure 1*, showing a rather common condition where the thickness of the bad roof strata is not very great. In this case the width of the working place is limited by the beam strength of a hard material at some distance above the coal and the weight does not increase proportionally with the width of the working place before the breaking limit of the higher strata is reached. In such a condition light timbers are sufficient.

The second condition of good top is illustrated in *Figure 2*, where the strength of the roof will naturally span a certain distance without breaking. If this width is exceeded in the working places, then some additional support must be provided and the workable width will be that capable of being spanned by the natural strength of the roof rock acting as a beam plus the additional strength of the supporting timbers. Depending on the thickness of the strata, the effective width of the working places can be materially increased by the use of heavy timbering.

The third condition where the roof strata is extremely strong and thick is not so common, but on the other hand it is not unusual. In such cases the strength of the rock is such that any artificial support by timbers can add but a small percentage to the effective span width and when this natural limit is reached and a break is about to occur ordinary timbering is not effective to prevent it.

In making a complete extraction the roof will act in one of three ways—first, as a continuous subsiding beam sup-

ported by the coal face and by pack walls as illustrated in *Figure 4*; second, as a beam supported by the slab coal face at one end and by a small pillar at the other as illustrated in *Figure 5*, and third, as a cantilever overhanging the coal face as illustrated in *Figure 6*.

There are several methods of pillar recovery which have been developed for hand loading, and the roof action in each of these is so well known that the most suitable method can be determined in any of the known fields. The four methods most commonly in use for the recovery room pillars are (1) by splitting, (2) by longitudinal slabs, (3) by cross cuts, (4) by open end cuts.

The splitting method is not widely used, and is confined more to seams with bad top that falls in the rooms before the pillars retreat. The expense of cleaning up the rooms is such that in some mines it is more economical to make a low coal recovery by driving an entry or room up through the standing pillar and leave a fairly large percentage unmined. The roof support in an example of this kind is the same as in first mining and only requires timber to keep the entry open. No caving or subsiding action is involved at or near the working face. This method is not used with mechanized loading except in a few instances where conveyors are employed to drive the spit, and this use is decreasing rather than increasing.

The slabbing method consists of making a longitudinal slab or series of slabs in the room pillar. This requires a strong top capable of spanning across two rooms supported by a small part

of the pillar which is left unslabbed. With the slow rate of hand mining it frequently happened that a room would cave before a pillar was recovered, and this method was not widely used. With conveyor mining, however, this method is quite popular. The rapid rate of conveyor mining permits complete or nearly complete extraction of the pillar and the fact that usually only one pair of rooms is worked at a time removes the objection to this method, which is had in hand mining, where a number of slabbing pillars working simultaneously opens a wide area and forms a potential source of a squeeze. The roof action is somewhat similar to that illustrated in *Figure 5*.

The open end method of pillar recovery requires a cantilever roof action as shown in *Figure 6*, with the top breaking on timbers and not back on the coal face. It is obvious that that roof strata must be of a special nature to satisfy this condition and also careful timbering is necessary. This method, while used with hand loading, is becoming increasingly popular with mechanized loading, and has many advantages over the other methods of roof action, where it can be worked successfully.

The method of recovering pillars by cross cuts is the one most widely used with hand loading. Many different arrangements are employed, but the roof action generally is that shown in *Figure 5*. In this the roof over the working places acts as a beam supported by solid coal at each end, and the mining width of the working place is increased until the limit of the span has been reached.

At that time the area is abandoned, the roof is allowed to cave and a new cross cut is started. This principle has been well proven in so many hand mining operations that its success cannot be questioned. The small amount of coal left is not a serious factor either from a recovery standpoint or in its effect on the ultimate cave or subsidence of the general overburden. It is particularly adapted to roofs which cannot be worked open end and it is correct in theory in that it uses the solid coal both for a support and for a fulcrum to break the overlying strata. The results in actual mining show that solid coal has a superior efficiency to any artificial support yet developed.

While the examples of roof conditions and pillar recovery shown in *Figures 1* to *6* are general and do not cover the entire scope of mining, they are submitted with this article to show that the three general methods of roof support in pillar recovery used in hand loading involve three different roof actions. It will be at once evident that the variety of roof strata shown in *Figures 1* to *3* would not have equally successful results with all of the pillar recovery methods shown in *Figures 4* to *6*. The main object of this report is to bring out this point and to show that an analysis of the roof conditions should be made either by study or by experiment before attempting any change in the mining system.

NOTE: Modifications of these systems as employed by mechanized mining and the roof action which is had will be described in a subsequent report.

TYPICAL ROOF CONDITIONS



FIGURE 1

Weak roof supported on timbers. Width of span determined by overlying strata.



FIGURE 2

Natural span of roof increased by timbers.



FIGURE 3

Strong top—Timbers unnecessary to support roof.

TYPICAL ROOF ACTIONS WITH HAND MINING



FIGURE 4

Longwall roof subsiding on packs.



FIGURE 5

Room Pillar Recovery—Roof breaks on coal.

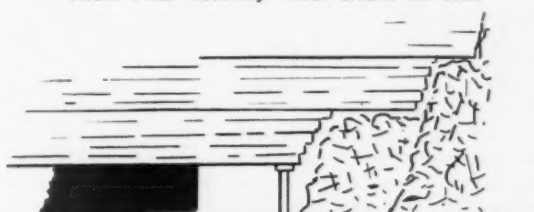


FIGURE 6

Open end pillar recovery.

PRACTICAL OPERATING MEN'S DEPARTMENT

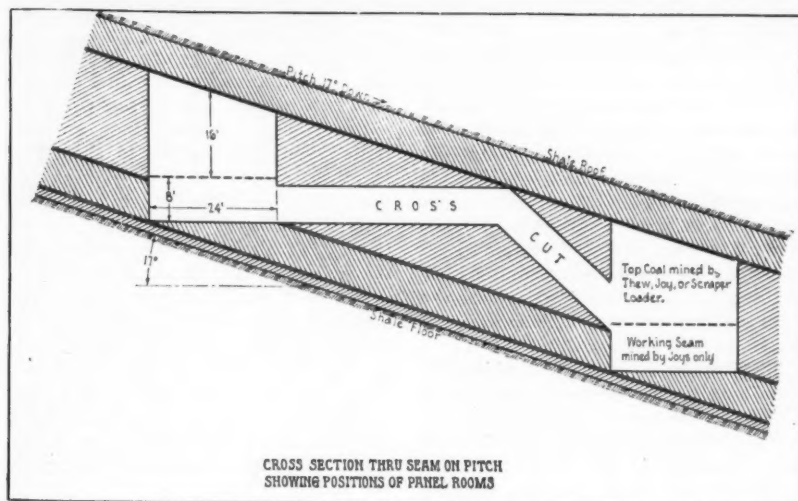


COAL

NEWELL G. ALFORD

Editor

Practical Operating Problems
of the Coal Mining Industry



CROSS SECTION THRU SEAM ON PITCH
SHOWING POSITIONS OF PANEL ROOMS

By O. G. Sharrer*

RECENT DEVELOPMENTS in MECHANICAL LOADING on **Pitching Seams**

MECHANICAL loading has now progressed far enough to have begun to develop a technique of its own and various systems and applications have developed far enough to prove that they are more or less permanent and future progress can be prophesied at least in part. Loading in pitching seams has encountered certain difficulties which has led to radical departure from what would be considered good practice in level work, and due to more difficult haulage problems has caused more varied application of machines and methods. The problems encountered in the Hanna mines are peculiar to these properties, for the seams themselves are very different from the average of coal seams now being mined.

* Mine superintendent, Union Pacific Coal Company, Hanna, Wyo.

The Hanna coal measures are of very recent origin geologically speaking, for they are in the lower tertiary geological period. As in all of the younger coals the moisture and volatile content is fairly high, and this condition, with a small amount of free sulphur, makes this coal fire easily either underground or in storage. The seam is fairly gaseous and the ventilation of exceptionally high places quite often becomes a very difficult matter. The No. 2 seam in which all mechanical loading is being done at the present time averages between 30 and 33 ft. in thickness, but, owing to the soft shale, which is immediately under and over the seam, some coal must be left on both top and bottom, leaving about 26 ft. of seam in which mining can be carried on.

All development mining is carried on

in the 7 ft. 6 in. working seam, and the 19-ft. top coal bench is recovered during second mining.

TYPES OF MACHINES IN USE

No one machine has been developed that will load coal on all conditions of pitch which necessitates having two or more types of machine in each mine. Experiments have been made with many different types of mechanical loaders, but at the present time only three types of machine are in use, each having proved its worth under suitable conditions.

The Joy 5-BU is used for all strike places both for entry development and room work, also top coal recovery. This machine has given excellent results both as to tonnage and cost, a maximum of 500 tons having been loaded in top coal

in an eight-hour shift and the average per machine, including entry and all development machines for the year 1930, is 231 tons to date.

The Joy 5-BU is limited to a pitch of about 12 degrees, if the machine is to work directly on the pitch of the measure, and as our pitch is over 17 degrees some other machine had to be developed for uphill development.

The shaking conveyor and duckbill has been adopted as the standard machine for driving uphill panels and air courses, and has proven to be very economical and speedy. Machine shift tonnages on this machine are not as large as on some other types, but the economy over any kind of hand loading is remarkable. Uphill panels are driven in pairs with a conveyor in each place. The crew consists of three men loading and timbering and two men cutting and blasting. Averages of 220 ft. of yardage per week have been maintained over long periods of time.

In taking care of excessive peaks the large scraper has proven to be a very good investment and has been accepted as standard equipment where suitable conditions are encountered.

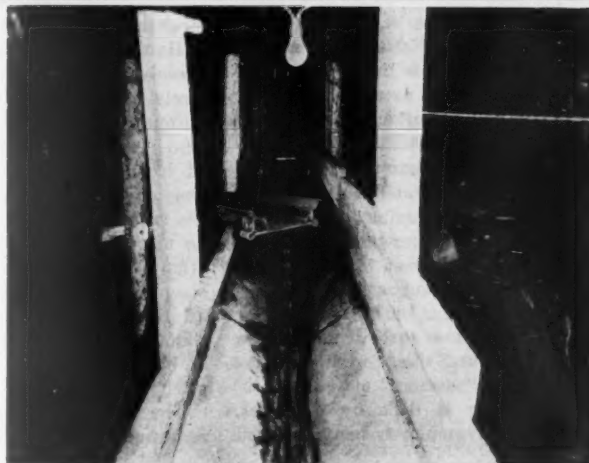
This machine has been developed on the Union Pacific properties and has described in other issues of THE MINING CONGRESS JOURNAL. The average tonnage per machine shift during 1930 is 333 tons, with a very low cost.

The three types of machine described are loading all coal in No. 4 mine, and each will operate successfully under its suitable condition, except where places must be driven directly down the pitch. No loading machine has as yet been developed which will successfully load coal out of places dipping more than 12 degrees. A machine which would load out of steeply dipping slopes would fill a long felt want in the Rocky Mountain region, for the driving of such slopes is the most expensive and slowest of all the mining operations in this field.

COST DATA AND PERFORMANCE RECORDS

There is a certain class of American industrial leadership which tends to look upon the various cost sheets and performance graphs pink, green, and yellow as being the beginning and end of successful management. Cost sheets are compiled and studied as the Mohammedan studies his Koran. There is no doubt that accurate cost and performance records have done wonders for the business of coal mining, but they are not the force that turns the wheels.

The most accurate study of this kind is at best an historical document, and a beautiful graph plotted from last month's operation does not in any way afford means of predicting what next month's performance may be. Each sheet is only a measure of water which



Top, 5 BU. Joy Loader.

Center, Eickhoff at face with "Duckbill," high coal type.

Right, Button conveyor bin

has already passed over the dam and progress can be made only by a careful study of the actual operation itself. This involves something that is quite often overlooked, namely, old-fashioned "common sense" and "know how"; neither of these is acquired by a perusal of records.

Graphs, which are used to an enormous extent today, are a good example of some very good tools which are used for the purpose of self-deception. Many things can be shown by graphic analysis, but in order to show a curve which is really informative, mathematical laws must be followed or the resulting information is absolutely useless.

Curves plotted from previous performance are in no way indicative of future conditions, and quite often when the graph shows exceptionally favorable trend it indicates that good conditions and not good management have been the great contributing factor.

We need all the cost records and performance records we have been collecting, but we should accept them for what they are—history not prophecy.

Many people wish to see cost sheets present a regular even appearance, and this is a very desirable state of affairs, if they will remain that way without help, but whenever we attempt to make them become even and monotonous we might just as well throw the whole thing away, for we are admitting, unconsciously, that we are doing about as well as we can expect and nothing further can be done.

In order to progress we must try new things, and when we try new methods we must make a few mistakes; these mistakes cost money, and must, of course, show up on the cost sheet. Quite often a fluctuating cost sheet is a healthy sign, for it shows that things are moving and have not assumed a monotonous dead level.

EARNING CAPACITY AND METHODS OF PAYMENT

Fuel demand upon the Hanna mines fluctuates very severely, going from a low of 24,000 tons in June to a maximum of 64,000 tons in October, with month-to-month variations throughout the entire year. It is the policy of the company to maintain as near as possible a constant number of employees and at the same time never to have the property over or under manned. When the mines were hand operated, this condition was absolutely impossible, for an increase of, say, 100 tons per day, meant adding about 10 new men to the pay roll, and usually about August 15 there was an incursion of from 100 to 150 "boomer miners," who were sure of about five months' work, and then forces were reduced and the "boomers" moved on.

Since loading is done by machines, the number of employees has remained

constant throughout the year, and at the same time very severe demand peaks have been handled much easier than in the past. When the demand drops to minimum, machines are taken from full production and put on development, crews are cut, and the extra men put on track extension, timbering, air-course cleaning, and other work which is essential but at the same time non-productive.

The scrapers are stopped entirely and the crews are assigned to other duties. This permits development and major repairs to be done at a time when the underground management can give it the maximum supervision, for they are not bothered with the problem of maximum tonnage. When the heavy demand comes on again the development and maintenance work is far enough ahead that it can be stopped for a time and all men put on full production. Machines are put in wide work and double shifted where necessary until the output will care for the demand. This system requires that the employees be very versatile, but the lure of steady employment causes men to forget the idea of "one man one job," and we have many men who can qualify for four or more underground occupations.

Naturally the mine cost varies considerable under this plan, but this is merely an example of the healthy variation discussed under cost data, and by budgeting the expenditures for various factors, as development maintenance, etc., the annual cost can be controlled.

In order to allow ambitious workmen to earn more than a certain fixed wage an experimental bonus plan has been worked out. This plan does not in any way interfere with the regular wage scale, as no one is penalized for under-performance, all bonus being in excess of the regular scale. This experimental plan has been in operation for several months and shows great promise of working out very well, but the experiment is too new to allow any prophesies as to its future worth.

HAULAGE AND CAR SIZE

Haulage from mechanical loading in a steeply pitching seam presents an entirely different problem from what one encounters where seams are level or nearly so. Where seams permit the use of locomotive haulage throughout, cutting and loading machines can traverse the entire mine on their own power and do not interfere with the normal operation of haulage, but where the pitch is steep enough to require rope haulage all these machines are helpless, except when traveling on the strike, and must be handled by the haulage ropes on the pitch at considerable loss of efficiency.

The synchronization of all these elements requires very careful study, if the

haulage is to proceed without too much interruption. In our own case we try as much as possible to do our undercutting on the night shift, which allows the cutting machine moving to be done at a time when it will not interfere with production. However, if we kept a hoistman and rope rider on each panel just to move cutting machines, the cost would be prohibitive, and to offset this we usually work one development loader on each panel on the night shift, so as to get enough coal to offset the labor cost of moving cutting machines.

Car size is a large factor in mechanical loading under any condition, but in steeply pitching seams the solution is not so simple. In level mines with locomotive haulage the car can be made as large as entry clearances will permit, but with rope haulage there is a definite limit to car sizes due reasonable limits of rope size and power peaks. The load limit on any rope is very clearly defined, and if too large cars are used the only result would be that the cars would cost more than necessary and no more coal would be moved. Careful consideration of all factors of pitch and convenience of handling indicates that a car of 4-ton capacity will prove the most economical and will be the size used in all future operations.

Many problems of mine mechanization are similar in all fields, and machines are rapidly being developed to meet almost all conditions of mining. Underground progress has been so rapid in the last few years that shop and surface practices have been left in the rear. The greatest economies will, in all probability, be obtained in the future from a "rationalization" of surface practice rather than through any startling innovations underground.

Dr. O. E. Kiessling has been made chief economist of the Mineral Statistics Division and W. W. Adams chief statistician of the newly created demographical division in the Bureau of Mines. Dr. Kiessling succeeds Frank J. Katz, deceased. Since 1927 he has been a member of the staff of the Economic Branch of the Bureau. He is the author or joint author of numerous Bureau reports on the economic phases of the mineral industry.

The Demographical Division, which will function as a part of the Bureau's Health and Safety Branch, will conduct statistical studies regarding the health, safety and welfare of persons employed in the mineral and related industries. The work of the accident statistics section of the Mineral Statistics Division is transferred to the new division.

Mr. Adams became connected with the Bureau of Mines in 1911, but a few months after this branch of the Federal service was organized.

SAFETY as affected by SUPERVISION and DISCIPLINE

By A. U. Miller*

MINING has always been reputed to be one of the most hazardous of the basic industries, and until recent years the general opinion of those connected with the industry has been that accidents were to be expected and that it was almost a waste of time and money to make any very serious effort to prevent them. As a result of this opinion hundreds of needless deaths and injuries have been caused each year by falls of roof and coal, haulage, gas and dust explosions, poor ventilation, electricity, and other similar causes.

It is believed that the mining industry acquired the reputation of being hazardous because, until recently, no real organized effort was made in accident prevention work; and it is believed that the hazards inherent to some other industries which have low accident rates are as great as they are in mining. Nevertheless many of these industries employing thousands of men at a single plant have operated for months without a serious accident, some of them without a lost-time accident. These companies reduced their accident rates only where, after realizing that a large majority of the accidents were unnecessary, that they did not just happen but were the result of definite unsafe practices, an organized effort was made to eliminate the basic causes.

In recent years many leading mining men have realized that accidents are avoidable, and they are now making a determined effort to operate their mines with a minimum number of accidents, thereby eliminating not only the unnecessary pain, misery, and loss of life to the employes, but also the tremendous economic loss to the industry. These men have installed safety departments, require periodical inspections of their mines by competent safety men, hold safety meetings for officials and employes, have adopted safety rules, increased supervision and discipline, im-

proved living conditions, promoted welfare work among the families of employes, and require a medical examination of all applicants for employment; in addition, the companies in some instances have taken out group life insurance policies covering all employes after a certain period of employment. All of these improvements are producing favorable results; however, it is believed that two of the most important factors in accident-prevention work in mining, or in any other industry for that matter, are supervision and discipline, and upon these two factors depends the degree of success of any accident-prevention program.

Supervision may be defined as the act of overseeing with the power of directing. In other words, to be a real supervisor, one must have a thorough and practical knowledge of the work the men are doing in order to be able to instruct them in the safest and most efficient methods. An official should not only visit an employe often enough to keep in close contact with him, but should also study the habits, disposition, and physical conditions of those under his supervision, as these factors are oftentimes important in causing accidents.

The following quotation from an article appearing in the December, 1928, issue of *Industrial Welfare*, is as pertinent to mining as it is to machine-shop practice and indicates the general and increasing realization of the necessity of proper supervision and discipline on the part of the foreman:

The enforcement of rules for correct shop practice must be accomplished through the constituted disciplinary forces of the shop. Foremen need to be aware of the risks of the department and to instruct the worker in accident prevention. Even such slight matters as the failure to wear goggles when operating an emery wheel, or the wearing of torn or unsuitable clothing or shoes, demand increasing vigilance on the part of the foreman. Repeated violators of safety rules offer too great a menace to their fellow employes to be retained in the organization. The foreman is, after

all, the determining factor in accident prevention, because of his close contact with the worker, and for that reason his cooperation is the most valuable possession that the safety engineer can secure.

A "hard-boiled" dictatorial foreman can not expect to be successful in getting cooperation and efficiency from his men; in the past, many persons considered this hard-boiled attitude one of the essentials of a successful foreman. The present-day companies, however, that are making the greatest progress in accident-prevention work will not tolerate this attitude on the part of the foreman, as it causes hard feelings and unfavorably affects the mental condition of the employes, thereby resulting in lower efficiency, higher cost of production, and an increase in the accident rate.

Arthur T. Moroy, general manager of the Commonwealth Steel Co., Granite City, Ill., which employs about 4,000 men, makes the following statement in a pamphlet entitled "An Informal Message to Every Superintendent and Foreman":

We want here only a clean, upstanding, law-abiding class of foremen—men who are capable of being examples and leaders to their men and which will result in our having a better and better class of workmen throughout. The day of the to h— with you management is gone. All men have in them the divine image and likeness, and skillful friendship is making a reality of this better men. I like to think of the Commonwealth as a fraternity, each mindful of the safety and welfare of the other.

The above statement indicates the trend of thought of the higher officials of some companies regarding the attitude of the foreman when dealing with his men. In a sense, the foreman may be considered the connecting link between the employer and the employe, and if he is unfriendly or unjust and fails to give the employe a "square deal" the men will interpret his actions as reflecting the attitude of the management. On the other hand, a foreman who has the interests of his men at heart will do more toward improving the industrial relationship between employer and employe than anything that may be attempted by management.

The success of accident-prevention work depends chiefly upon the interest shown by the supervisor. If he is indifferent and lacks the necessary enthusiasm to inspire his men with the real purpose and value of accident prevention, the employe will also soon become indifferent. On the other hand, if the supervisor not only believes in safety, but practices it, and insists upon it, his men will finally become so accustomed to doing their work in a safe and efficient manner that it will become a habit with them.

Naturally, it would be less trouble

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Presented before the Harlan Mining Institute, Harlan, Ky.

for the company and the bosses if the men would look after themselves, and in the past it was generally considered by both the men and the companies that the miner, in accepting employment, assumed the risks incident to the job and that it devolved entirely upon him to protect himself against not only the hazards peculiar to his particular work over which he had personal control, but also against the acts of his fellow workman. The history of industrial accidents, however, proves that that employee will not protect himself against accident unless he is required to do so. It matters not who we are, or what our position may be, there are times when all of us require supervision; and if it is expected to reduce accidents to a minimum, it will be necessary for the supervisor not only to instruct the men in the safe and efficient performance of their work, but also to insist that it be done in that way. It is possible to place guards on machinery and thereby eliminate to a large extent the hazards connected with its use, but there will always be numerous other hazards that can only be guarded against by constant supervision, education, and discipline.

As an aid in the supervision of the men, a definite set of rules or directions governing the proper and safe way of performing the various tasks in the mine should be prepared and given to both the men and the bosses. These rules should be amended from time to time as may be indicated by a study of accidents or methods of doing work or of preventing accidents at the mine.

The strict and impartial enforcement of these rules by the boss is absolutely essential, and one of the best methods to insure proper supervision and strict enforcement of rules is for the management to hold the boss directly responsible for the men under his supervision. If an accident should occur which after an investigation is found to be attributable to lack of enforcement of the rules, the boss responsible should be disciplined either by reprimand, demotion, or discharge, as the occasion may warrant.

Investigations of mine accidents by engineers of the U. S. Bureau of Mines have led to the belief that the reduction of accidents is, other factors being equal, in direct proportion to the amount of supervision, and that those companies having the best records are those who hold their bosses responsible for the safety of the men working under them.

The cement industry perhaps offers the most striking example of accident reduction due to supervision, as indicated by the following excerpts from an article entitled "Safety and Production," which appeared in the September and October, 1928, issues of *Safety*, a maga-

zine published by the American Museum of Safety.

The data of the cement industry are particularly striking. They are complete for a period of six years, thanks to the Bureau of Accident Prevention, and Insurance of the Portland Cement Association, whose statistics cover 120 plants, 97,000,000 man-hours, and 90 percent of the entire cement output of the United States. During the period of six years reported, there is an increase of productivity of 32 percent, accompanied by a decrease of 29 percent in accident frequency, and a decrease of 30 percent in accident severity.

In literature published by the cement industry the writers state that their success in accident-prevention work has been due largely to intensive supervision. Part of their former program in accident-prevention consisted of holding frequent safety meetings among employees. These meetings did not produce the desired results and they therefore decreased the number held among the employees and increased the number of plant, district, and regional meetings of the supervisors, placing the responsibility of the education of the employees in safety methods and accident-prevention work upon the supervisors, with the successful results mentioned.

Substantiating the experience of the cement industry as a whole, the general manager of a large cement plant that has made an exceptionally fine safety record, makes the following statement:

It is our judgment that our ability to make this good safety record is largely on account of the cooperation of our foremen and the intense interest of all our men. Our foremen distinctly understand that we will not stand for lost-time accidents and that the foreman can not continue long with us if he does not properly instruct his men so as to avoid lost time accidents.

The following excerpt from the monthly *News Letter* of the Steam Railroad Section of the National Safety Council for April, 1929, indicates a similar experience by some railroad officials regarding the value of supervision and the policy of holding the supervisor responsible for the safety of the men working under him:

The foreman is the key man, whether it be in accident prevention, production, morals, or what not; then why not give the key man more consideration in your accident prevention work. Practically all of the accident prevention meetings which the Frisco Lines will hold this year will be with supervisors only. One meeting each month will be held with each superintendent and his staff and each master mechanic and his staff. The president of this railway holds each supervisor responsible for the personal injuries which occur under his jurisdiction. This makes a big difference in the receptive attitude of the supervisors toward accident prevention work.

The following table shows the results of this supervision on the above rail-

road for the month of January, 1929, as compared with January, 1928, all minor and major injuries are considered:

	Decrease in casualties, percent
Employees:	
Transportation Dept.	34.1
Maintenance of Ways Dept.	32.4
Mechanical Shops	33.5
Passengers	4.5
Autoists	45.4
Licenses	13.0
Trespassers	69.2
Total all injuries.....	29.7

H. W. Heinrich, assistant superintendent, engineering and inspection division of the Travelers Insurance Co., Hartford, Conn., makes the following statement in his paper entitled "The Origin of Accidents":

Through the analysis of 75,000 accident cases, through the study of actuary records and engineering reports, and with the cooperation of employees, we have found that 98 percent of industrial accidents are preventable and that 88 percent of the 98 of all industrial accidents can be prevented through the enforcement of proper supervision.

Interest in supervision and safety begins at the head of an organization and from thence is transmitted to the lower branches. Without the whole-hearted cooperation of the head of a company the safety movement and accident-prevention work are not at all likely to be a complete success in the operations of that company. In making this statement it is realized that the first official of an organization can not be in touch with all of the details of operation, as entirely too many men are employed for him to be in contact with more than a very small percentage. However, if officials, from the general manager down, realize that the head of the organization is "sold" to the safety movement, and expects them to make safety as well as production a part of the operation, they will take a greater interest in that phase of the work.

The adoption of safety rules, the education of the employees in the application of these rules, and the enforcement of discipline is clearly the function of the management. All accidents, except the very minor ones, should be investigated by officials of the company, the safety engineer, and a member of the engineering corps. The cause of and the responsibility for the accident should be determined at this investigation, and at the next meeting of the officials the cause of the accident and the remedial action taken to prevent a recurrence should be thoroughly discussed, as it is only by a thorough knowledge of how accidents occur that they may be prevented.

It is believed that as a general rule there is less supervision and discipline in mining than in any other industry. In mining, 25 to 150 men are placed under the super- (Continued on page 97)

SAFETY—

Responsibility of Management

By T. G. Fear*

PERSONAL injuries in industry are almost invariably the result of neglect or carelessness on the part of management, fellow employee, or the injured employee. For years personal injuries (erroneously) have been styled accidents, management has in many instances accepted the dictionary definition of the word "accident" as something which happens and can not be foreseen.

This type of management merely shrugs its shoulders and asks what can be done when its employees are injured. It may even go to the extreme and blame an unfortunate occurrence an act of providence, as was the case in an explosion some years ago in a mine which was known to have accumulations of both gas and coal dust.

Early in this year, I received a letter from an executive of a large coal mining company, relative to the institution of more rigid safety measures for his mines. He stated that, although he knew about what he wanted in the way of a safety organization, yet he was not confident that he could sell the idea to his Board of Directors. My reply was summed up in what I now term the Ten Commandments of Safety, which are:

I—Sell the officials of the company, from the chairman of the board to the section foreman, the idea that safety is simply the proper method of operating and is not a separate and distinct function; that the entire responsibility for operating safely rests entirely upon management; that they can not escape this responsibility either from a humane or cost basis.

II—The company must purchase safety, by providing the proper safeguards such as hand-rails, gear guards, shelter holes, proper clearances underground, ventilation, rock dusting, etc. Rate all plants for safety semi-annually to determine if further purchases are required.

III—Draw up and have printed a safety code covering all operations in and about the company's plants.

IV—Have every supervisory official carry a copy and be fully acquainted with every detail of the safety code, insuring this by providing schools of instruction and frequent examinations. These officials are responsible for the instruction of the day men and loaders in the safety code.

V—Institute absolute discipline to enforce this safety code which must apply to day men, tonnage men, and salaried officials without exception, fear or favor.

VI—Institute responsibility ratings of all personal injury cases to determine unsafe employees or officials. One plan for determining such responsibility ratings is outlined below:

Classification Committee:

Division Manager
Division Superintendent of Mining
Division Superintendent of Maintenance
Division Engineer
Division Mine Inspectors
Chief Gas Inspector

Classifications are:—

- 1—Sub-Standard Conditions
- 2—Violation of Rules and Instructions
- 3—Poor Supervision
- 4—Carelessness
- 5—Unavoidable

No. 1—Substandard Conditions:—

Under this classification shall be placed all injuries which have been caused by natural or mechanical conditions existing in violation of the mining law or the company standards. As an example, injuries caused by scant clearance, poor timbering, defective track, cars, motors, trolley wire, frogs, switches, unguarded equipment, etc.

No. 2—Violation of Rules and Instructions:—

Under this classification shall be placed all injuries which have resulted from a disobedience of the mining law, company rules or the orders of the fore-

man in charge or responsible for the work.

As an example, men riding front end of motor pushed trips, on loaded cars, between cars, detonators and explosives incorrectly stored and handled, flying switches, failure to re-rail cars and motors with jacks and re-railers, etc. Under this classification shall be placed injuries resulting from the failure of the workmen to immediately obey the orders of the official such as failure to take down loose coal or slate, failure to place timbers or any other order given for the workmen's protection, or the protection of others.

No. 3—*Lack of (or poor) Supervision:*—Under this classification shall be placed all injuries resulting from insufficient attention on the part of the official responsible for the work being done.

This classification shall include injuries resulting from hazards known to the official in charge but who has failed to have the hazards removed. Also under this classification shall be placed injuries resulting from hazard conditions which the foreman has failed to observe or, if observed, failed to correct.

Under this classification shall be placed all injuries, resulting from improper instructions from the official in charge of the work, also injuries resulting from the failure of the official to see that sufficient and proper materials are provided to safely conduct the work.

As examples, men injured in the working places where the foreman has failed to properly inspect and test the roof, injuries from failure to see that dangerous roof is taken down or timbered. Failure to see that tracks are properly placed and failure to inspect tools, explosives and other standard requirements.

No. 4—*Carelessness:*—Under this classification shall be placed all injuries resulting from thoughtlessness, lack of intelligence or education.

As examples, men injured while handling coal, slate or other material and catching hand between material and car, timber or rib, injuries caused when men hit their hands, feet, etc., with hammer or axes.

No. 5—*Unavoidable:*—Unavoidable accidents are accidents which no precautions can or would have prevented. As an example, a man handling slate or coal and the lump of coal or slate breaks in his hand and falls, injuring his foot. Such an accident might properly be classified as unavoidable.

VII—Institute safety courts, at each and every mine, in order to have your employee become more interested in safety rules. This works as follows:

"Any employee of the company, seeing a fellow employee violating a mining law or company safety rule, is supposed to

* General Manager, The Consolidation Coal Co., Fairmont, W. Va.
Presented to 19th Annual Safety Congress, Pittsburgh, Pa., October, 1930.

call the man's attention to the violation for immediate correction and then report to the sheriff. This procedure makes it necessary for all employes to have a working knowledge of the mining laws and safety rules which has added all our employes to our mine safety inspection force. As human nature is just as evident in coal mining men as any other class, the coal miner, including everyone from the trapper-boy to the highest official, will refrain from committing safety violations if he knows he will be caught. To most employes the stigma of being convicted in a safety court means more in a disciplinary way than the payment of a nominal fine.

"When supervisory men discovered infractions of safety rules, they are not permitted to have warrants issued for such violators as it is their duty to see that the proper discipline is meted out immediately. The primary purpose of the safety court is to enlist the aid of the entire personnel on personal injury prevention, to aid the supervisory force in eliminating hazards and hazardous practices, and to make every employe an inspector who will seek to cause everyone to conform to the rules and regulations prescribed by our safety department.

"Since January 1, 1928, there have been about 500 sessions of safety courts in our 30 operating mines and about 3,000 cases were tried with 95 percent convictions.

"During the first months of the court's operation, safety violations of various characters were reported which had never been detected by our regular mine inspection force.

"An employe tried and convicted may also be disciplined by suspension or discharge by the mine supervisory force in case the violation is of a serious nature."

Purpose of the Safety Court:

The safety court is an employe organization whose purpose is to stimulate interest in safety; to promote observance of the state mining laws and the safety rules and standards of the company.

It serves to draw the attention of fellow employes to the unsafe and careless practices which are the cause of most injuries and to instruct them in safe ways of working.

Organization of Safety Court:

At each mine or group of mines a committee of employes shall be appointed for the purpose of arranging for a safety court organization meeting, and for securing the attendance of the mine employes at this meeting.

At this meeting the organization committee shall outline the purpose of the safety court and shall describe the organization proposed for its administration.

The organization committee shall then

call upon the mine employes in attendance for nominations for the various offices of the safety court.

Nominations for the offices having been made the mine employes in attendance at the meeting shall then be called upon to vote for the nominees for the various offices.

The officers so elected thereupon take office and, during their term in office, administer the affairs of the safety court as herein provided.

Jurisdiction of the Safety Court:

Each safety court shall have jurisdiction in and about the mine or mines which it serves.

The safety court may summon, try, judge, and pronounce sentence, if found guilty, any employe of the company who fails to (while within the jurisdiction of the court) obey the state mining laws, or the safety rules and standards of the company.

Visitors or those in the employ of other companies may be warned by the safety police as to violations of the laws and rules, but they are not to be summoned before the safety court.

Officers of the Safety Court:

A safety court shall consist of the following elected officers:

- One Judge
 - One Clerk of the Court
 - One Sheriff
 - One Prosecuting Attorney
 - One Attorney for the Defense
- Qualifications for Safety Court Officers:*

Judge—A person to be eligible for the office of judge shall be acquainted with correct underground practices, and shall have been an employe at the mine for a period of at least one year.

Clerk—A person to be eligible for the office of clerk shall be able to take notes quickly and accurately, and able to properly keep the minutes of the safety court sessions.

Prosecuting Attorney and Attorney for the Defense—A person to be eligible for either of these offices shall have been an employe at the mine for a period of at least six months.

Sheriff—A person to be eligible for the office of sheriff shall have been an employe at the mine for a period of at least one year.

Term of Office of Safety Court Elected Officers—The term of office of the safety court judge, clerk, sheriff, prosecuting attorney, and attorney for the defense, shall be for a period of three months.

Appointment and Term of Office of Safety Police—The safety police are to be appointed by the sheriff for a period of one month.

The names of the safety police shall be kept secret and shall not be made known by the sheriff or the safety police until they appear at a session of the

safety court to make charges of safety violations.

Re-appointment to the office of safety police may be made at the discretion of the sheriff.

The sheriff shall appoint such a number of safety police as are necessary to properly cover the territory within the jurisdiction of the safety court.

Duties of Safety Court Officers:

Judge—Shall preside at and be responsible for the proper conduct and procedure at all sessions of the safety court. Shall pass judgment on all cases brought before him.

Shall call all meetings of the safety court. Shall call juries when same are demanded.

Clerk—Shall keep the minutes of all court sessions, the recording of all cases tried, judgments rendered, and fines imposed. Shall keep an accurate accounting of all moneys collected and disbursed.

Prosecuting Attorney—Shall vigorously prosecute in accordance with the state mining laws and safety rules and standards of the company, all defendants brought before the court for trial.

Attorney for the Defense—Shall defend all accused persons brought before the court, except where the accused prefers to make his own defense, or elects to choose his own attorney for defense.

Sheriff—Shall appoint the safety police and see that they function properly. Shall turn in to the prosecuting attorney at least three days before any meeting data, written charges against any violation of the safety standards.

Duties of Safety Police—It shall be the duty of the safety police to keep a watch for and to report to the sheriff all violations of the state mining laws and the safety rules and standards of the company, irrespective of the status of the persons violating them.

It shall be also the duty of the safety police to report to the sheriff all practices which have a bearing on general safety conditions.

Sessions of Safety Court—Sessions of the safety court shall be held monthly. At each session, the data, time and place of the next session shall be determined and announced.

Safety Police Reports of Violations of Laws and Rules—The safety police shall report to the sheriff each violation of the state mining laws and of the safety rules and standards of the company. These reports or charges must each state the name of the violator, the nature of the violation, the names of the witnesses thereto, and the place and the time at which it occurred.

Bringing Safety Violators to Trial—The reports or charges of the safety police shall all be turned over to the prosecuting attorney by the sheriff not later

than three days before the date of the session of the safety court.

The prosecuting attorney will thereupon immediately have the clerk of the court issue and the sheriff serve, summons in writing to the safety violators and the witnesses mentioned in the reports or charges.

The failure of any safety violator to appear when summoned shall serve automatically to judge him guilty of the violation as charged.

Conduct of Safety Court Trials:

The clerk of the court shall announce each case.

The prosecuting attorney shall make the charge, present the evidence, and take such steps as are necessary to put the charge and evidence before the judge and jury.

The attorney for the defense, or the defendant himself, or his attorney, at the defendant's option, shall present the defendant's side of the case, and shall take such steps as are necessary in that connection.

The defendant shall have the privilege of calling witnesses in his behalf, and shall have the right to demand a trial by jury, or to select an attorney for his defense.

When the defendant demands a trial by jury, the judge shall designate the three men to serve, subject to right of challenge for cause by the attorneys for the prosecuting and defense, each side having the right to challenge two. A majority vote of the jury shall decide.

After hearing the charge, the evidence and pleas of the prosecution and the defense, the judge shall announce the verdict, and, in case of conviction, the penalty imposed.

The judgment and penalty shall thereupon be made a matter of record by the clerk of the court, and the sheriff shall proceed to collect the fines imposed.

Fines and the Handling of Safety Court Funds—The funds collected by the employes safety courts are committed to the control of the safety court officers, and are to be distributed by them only for charitable purposes among the employes of the company and their families in and about the mine or mines which the safety court serves.

The safety courts shall, when and as they decide, issue orders upon the custodian of the safety court funds; the custodian shall be the local auditor or other properly bonded employee.

The safety courts shall, when and as they decide, issue orders upon the custodian of the safety fund, for distribution from the fund.

Any person judged guilty of being a safety violator shall be fined. The minimum fine to be 25 cents and the maximum fine \$1. Any witness refusing to appear before the court shall be judged in contempt of court and shall be fined.

The minimum fine to be 25 cents and the maximum fine \$1.

The fines shall be collected by the sheriff when imposed and shall be turned over by him to the custodian of the safety court fund.

The clerk of the court shall keep an accurate record of all fines imposed by the court, collected by the sheriff, and turned over to the custodian of the safety fund.

The clerk of the court shall also keep accurate record of all authorizations of the court for disbursements from the safety court fund and shall keep continuous check to insure proper handling, use and conservation of this fund.

Vacancies—If a vacancy occurs among the officers of the safety court then the remaining officers shall immediately meet and select, by majority vote, a man qualified to fill the vacant office for the unexpired term.

VIII—Establish 100 percent first aid training at each plant, so that every man from the superintendent to the trapper boy is proficient enough to receive a first aid certificate. Trained men taking care of injuries to their fellow employes are impressed by the suffering and prevention of injuries is brought more clearly to their attention.

IX—Keep the mining plants clean on the surface and underground, and hire safe men by giving them physical and oral examinations before employing them.

X—Remember that "eternal vigilance" is the price of safety.

In each of these 10 rules, you will note that management is entirely responsible for all employes from the time they are employed and go to work until they turn in their time checks at the end of the shift.

Management must, from a humane standpoint, provide safe working places and tools to its employes, in order that they and their loved ones may be spared and sufferings which personal injuries in industry have been exacting.

Management must, from the cost standpoint, reduce the personal injuries to a minimum, which will include only purely accidental injuries.

Reducing costs by preventing human suffering is a most pleasant and noble work and, to the management which honestly and sincerely carries on to the limit, personal injury prevention, there must come a satisfaction such as came to Abou Ben Adhem in Leigh Hunt's poem.

SAFETY—SUPERVISION AND DISCIPLINE

(From page 94)

vision of one face boss, whose section is often so scattered that he has to travel several miles to make one round of his race territory; in some cases he can not visit

the working places oftener than once in two days. In addition, the boss has to supervise the handling of mechanical equipment and the timbering, haulage, and ventilation, settle any difficulties that may arise with the workmen, keep the men's time, measure yardage, etc. Other industries usually employ one supervisor for every 5 to 30 men; a supervisor of such a force is thus enabled to keep in touch with his men at frequent intervals, and in many cases to have them under almost constant surveillance. There is no reason why more nearly adequate supervision should not be provided in the mining industry.

If the maximum number of men under one foreman were limited to 25 or 30, he could visit each working place at intervals not more than two hours apart and would thus be able to instruct the men properly and to see that his instructions were carried out.

It is believed that the reduction in accident cost and the increased efficiency of operation will pay for the increase in cost due to the employment of additional supervisors.

If intensive supervision and strict discipline have been so successful in reducing accidents in other industries and in the mining companies who have put these measures in force, it is reasonable to believe that their employment would be equally successful in the mining industry as a whole. It is hoped that the day is not far distant when those entrusted with the operation of our mines will realize the extreme importance of supervision and discipline in the reduction of accidents.

LEGISLATIVE REVIEW

(From page 87)

planning, to report plans for economic relief by February 1, 1931. Rules.

S. Con. Res. 36. Mr. Wagner (Dem., N. Y.). This resolution would create a commission of five Senators, and five Representatives to consider and report by December 7, 1931, on unemployment insurance systems in use by private interests in the United States and by foreign governments, with legislative recommendations. Commerce.

S. 5634. Mr. Wagner (Dem., N. Y.). This bill proposes to appropriate \$100,000,000 to be divided among the states for cooperation with them in providing insurance against unemployment. Commerce.

H. R. 15924. Mr. Evans (Dem., Mont.); and S. 5501, Mr. Caraway (Dem., Ark.). These bills would appropriate \$12,000,000 each for three years to assist the states in pensioning the aged. Judiciary and Labor.

S. 5437. Mr. Patterson (Rep., Mo.). This bill would authorize the Court of Claims to consider a claim of the Cherokee Fuel Co., against the Government.

PRACTICAL OPERATING MEN'S DEPARTMENT



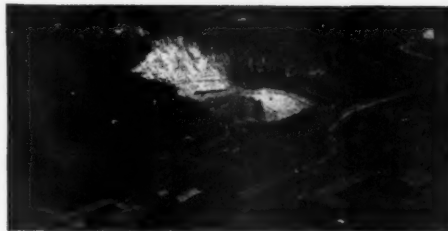
METALS

GUY N. BJORGE

Editor



Practical Operating Problems
of the Metal Mining Industry



Plant and Equipment AT HARMONY MINES

THE property of the Harmony Mines Company is located in Lemhi County, Idaho. Lemhi County is one of the larger counties in the State of Idaho, and is located in the east-central portion. It is for the most part a country of high plateaus and precipitous mountain ranges, with narrow fertile valleys. The higher mountain slopes reach an eleva-

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tion of 10,000 to 12,000 ft., as contrasted to the valleys with an average elevation of 4,000 to 6,000 ft. Considerable variation in climatic conditions at different elevations is apparent. In the vicinity of the property two main rivers; namely, the Salmon River and the Lemhi River, form their juncture at the town of Salmon. Salmon is the county seat and is approximately 12 miles in an air line from the mine in a north-westerly direction and 18 miles by road.

Previous to the building of the railroad into the county in 1910, the county was particularly inaccessible.

The Gilmore & Pittsburgh Railroad, a subsidiary of the Northern Pacific, serves the county and connects with the main line of the Oregon Short Line Railroad at Armstead, Montana. The shipping point for the property is Baker, Idaho, 10 miles south of Salmon and 8 miles from the mine. Since 1910 excellent highways have gradually been completed until now the county is readily accessible from Montana and Utah points over improved roads.

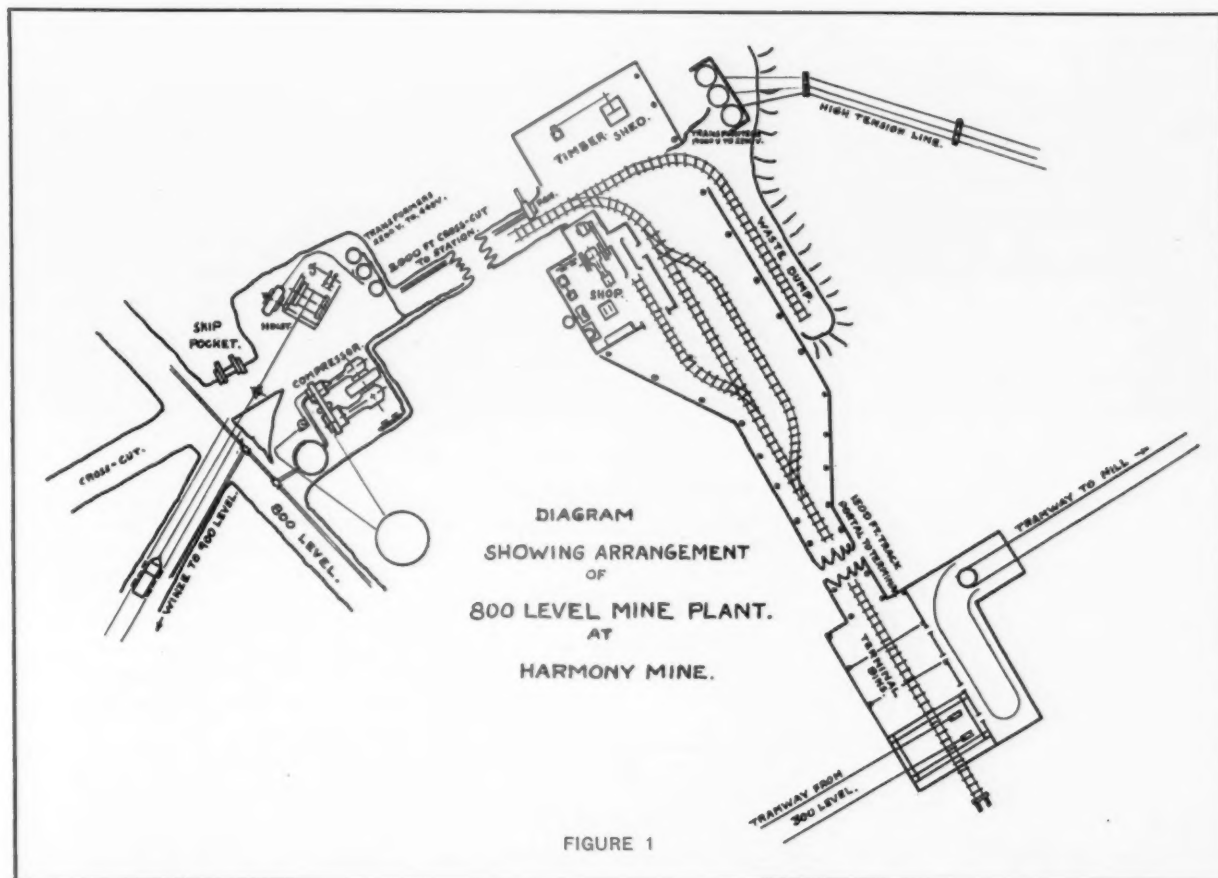
The present 450-hp. Diesel engine power plant is located on the railroad at Baker, Idaho. The mine is reached over auto and truck road 8 miles up Withington Creek canyon to the mill camp at an elevation of 7,200 ft. The portal of the main adit level, or 800 Camp, is at an elevation of 8,000 ft., or 800 ft. vertically above the mill camp. Other workings of the mine are at higher elevations.

Copper is the metal of greatest value, although the ore contains small amounts of gold and silver. The ore occurs in sheeted or shear zones in a light gray siliceous shale of pre-cambrian age. Pay-



By
Earl F. Nieman,
E. M.*

*Concentrator and Mill camp
of the Harmony Mines Com-
pany as seen from the 800
level tram terminal*



able ore varies from 3 to 22 ft. in thickness in regularly occurring ore chutes, showing stope lengths of 70 to 400 ft. The shrinkage stope method of mining is employed. Approximately 10,500 ft. of underground development has been completed, the lowest level of the mine being designated as the 900 level, representing about 1,000 ft. of depth along the dip of the deposits.

The relative inaccessibility of the property and attendant high transportation costs has necessitated the maintaining of a low labor turn-over and the supplying of the property with the most dependable and efficient equipment obtainable. As rapidly as possible, labor and cost saving equipment has been supplied. The property is one of the most completely equipped mines in that section of the State.

The subject of Plant and Equipment at Harmony Mines may be conveniently subdivided into the following headings: Mine plant and equipment; milling plant and equipment, and power plant and power lines.

MINE PLANT AND EQUIPMENT. The ruggedness of the topography and attendant steep mountain slopes, has made the development of this property by means of adit levels the most advisable. Operations at present are confined to

two adit levels known as the 300-level camp and the 800-level camp. Operations at the 300-level camp are more or less of a temporary character until such time as raise connections are established between the 800 and 300-level, when most of the work will be centralized at 800 camp.

800-Level Camp

The general arrangement of the equipment and camp at the 800-level is shown in figure 1. The adit tunnel 2,300 ft. in length is 6 by 8 ft. in section and is equipped with 3-in. air line and 10-in. galvanized iron ventilating tube; ventilation being furnished by a motor driven suction fan at the portal of the tunnel, assisted by two compressed air-operated "boosters" within the mine. The track is 18-in. gauge, 30-pound rails laid on 4 by 4 sawed ties. Armored high tension, underground cable, supported on wood brackets, at the back of the tunnel, encloses three No. 4 copper wires and conducts 2,200-volt current from the high tension transformers at the portal of the tunnel, to the compressor and hoist station 2,000 ft. underground. The main adit tunnel, hoist, compressor and 800-level station is lighted from 2,200-220-120 light transformers.

An all-steel hoist constructed by the

Eastern Iron and Metal Company, of Salt Lake City, Utah, is installed at the 800-level station. It has a rope pull of 3 tons and a speed of 200 to 300 ft. per minute at full load. It is geared to a 50-hp., 440-volt, Westinghouse slip ring motor with variable switch control. Four-hundred-forty-volt current is supplied from three 25-kv. a. Westinghouse transformers taking 2,200-volt current from the main underground cable and reducing to 440-volt for the use of the hoist and pump below the 900 level. A 36-cu. ft. skip of local design and made by the Western Iron Works, of Butte, Montana, is used in the main winze and is dumped automatically into a skip pocket of 150 tons capacity above the 800-adit level.

A 987-cu. ft., two-stage, air compressor, manufactured by the Chicago Pneumatic Tool Company, is being installed at the 800-level station, to replace an obsolete 800-cu. ft. machine installed at the mill camp, and to eliminate excessive length of air line. This compressor is direct connected to a 150-hp., 2,200-volt motor. Cooling water is supplied from the lower levels to water tank installed in an old stope above the 800 level.

Ingersoll-Rand R. 72 Leyner machines, using 1¼-in. hollow round drill steel, are used in most of the drifts and cross-cuts. Self-rotating, Gardner-Denver

FLOW SHEET OF HARMONY MINES

150 TON

FLOTATION PLANT.

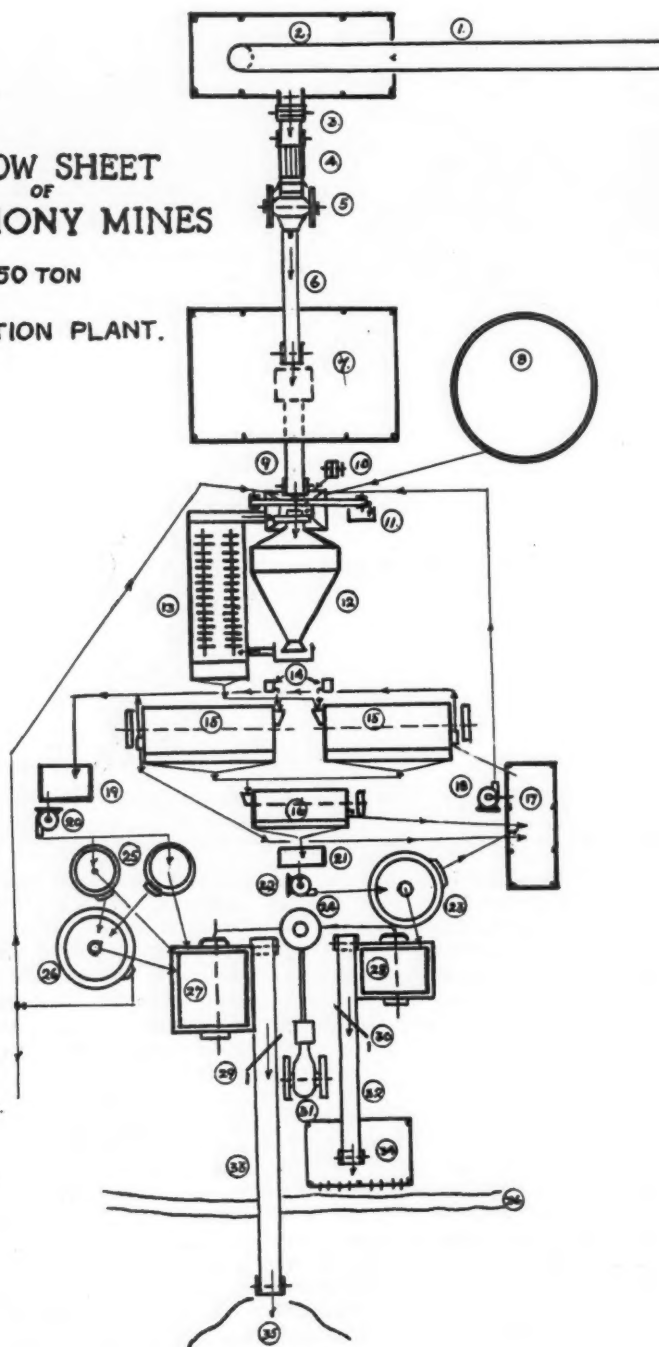


FIGURE 2

Flow-sheet
Harmony Mines Company
Baker, Idaho

Equipment List, Flotation Plant

1. Tramway from 800 level terminal.
2. 200-ton receiving bin.
3. Coarse ore feeder and 24-in. magnetic pulley.
4. Grizzlies. 1½-in. opening.
5. 12 by 14-in. jaw crusher.
6. Inclined bucket elevator.
7. 400-ton receiving bin.
8. Mill supply water tank.
9. Feed conveyor.
10. Oil feeder. P. & E. oil.
11. Head sampler.
12. 7 by 36-in. Hardinge ball mill.
13. 4-ft. 6-in. by 18-ft. Dorr duplex classifier.
14. Two Pine oil feeders.
15. Two 14-ft. K. & K. rougher cells.
16. One 6-ft. K. & K. cleaner cell.
17. Sump tank.
18. 3-in. sand pump.
19. Tailing pump sump.
20. 3-in. sand pump.
21. Concentrate pump sump.
22. 1-in. Wilfley sand pump.
23. 9-ft. Allen slime cone.
24. Vacuum tanks.
25. Two 4-ft. Allen sand cones.
26. 9-ft. Allen slime cone.
27. 8 by 8-ft. Portland filter.
28. 4 by 8-ft. Oliver filter.
29. Tailing sampler.
30. Concentrate sampler.
31. 10 by 14 vacuum pump.
32. Concentrate conveyor.
33. Tailing conveyor.
34. 120-ton concentrate storage bins.
35. Tailing dump.
36. 8 mile road to railroad.

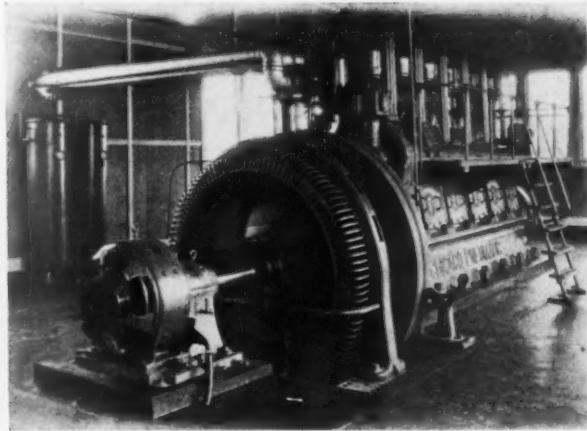
stopping machines are used in stopes, together with a few of the hand rotated type for special purposes. One-in. quarter octagon drill steel is used for stoping. Sixteen-cu. ft. roller bearing mine cars are employed on levels below the 800.

Hauling equipment on the main adit level consists of 15 2½-ton, side dump, roller bearing cars, manufactured by the Ottumwa Iron Works, drawn by a 7-ton

mancha storage battery locomotive. Distance of haul from chutes on the 800 level to the receiving bins at the 800 terminal is approximately 3,500 ft.

At the portal of the 800-adit level the main buildings consist of mine shop, timber framing shed, change house, bunk house, boarding house and foreman's quarters. The main shop is 30 by 30 ft. in plan and is of two stories. The lower

floor contains drill sharpener, oil and coal forges, haulage locomotive battery charging set, battery racks, drill press, repair bench and a small 210-cu. ft. Chicago pneumatic belt driven air compressor, from a Westinghouse 30-hp. 2,200-volt motor, for auxiliary use when the large compressor is not in use. The upper floor contains store room for rock drill and mine equipment repairs and re-



Interior and exterior views of the power plant of the Harmony Mines Company, at Baker, Idaho

pair bench. The timber framing shed contains cut-off and rip saws, driven from motor, for supplying the mine with split lagging; wedges and timbers cut to the proper length.

The change house is supplied with stationary wash basins, showers, and hot and cold running water. Hot water is supplied by electrically heated tanks. The bunk house contains 10 separate rooms, two beds to the room, and will comfortably house 20 men. Hot and cold running water is supplied in the wash room of the bunk house. The boarding house contains large dining room, kitchen, storerooms and bedrooms. The kitchen is supplied with hot and cold running water, large electric cooking range and also a wood range. All buildings are electrically lighted throughout.

The 800-level portal is approximately 1,500 ft. from the receiving bins of the main tramway terminal. Due to the heavy snow fall in the winter months, this trackway is entirely under shed, consisting of heavy timber frame, with corrugated sheet iron covering. Ore is delivered over this trackway to two 800-ton receiving bins above the terminal of the main tramway. These bins are of heavy timber construction, flat bottoms, with 6-in. "bulldozing" grizzlies, constructed of heavy rail, between the two bins. Buckets of the small "jig-back" tramway between the 300 and 800-level terminal, dump automatically into the upper receiving bin of this terminal, as well as the 2½-ton cars from the 800 level.

300 Level

Sixteen cubic-foot, 18-in. gage, roller bearing mine cars are used on this level. Twenty and 12 pound rail form the track. Mule haulage is employed, using 4 to 6 cars per trip. Cars are loaded from chutes at the skip pocket, at the collar of the winze from the 400 level. Gardner-Denver sinking machines are

used in sinking operations in the winze and R 72 Leyners are used in the drifts. Present hoist on this level consists of a Sullivan Turbinair, using a one-half ton sinking bucket. No permanent electrical equipment is installed at this level as it will not be required when raise connection is made from the 800 level.

Three-inch air line supplies air to the machines from 9¼ by 14 Chicago pneumatic single stage air compressor, belt driven from a 50-hp. 2,200-volt motor. Steel is sharpened on a Waugh Model 8 drill sharpener. One and one-fourth-inch hollow round drill steel is used. Ore cars are discharged into two 35-ton tramway bins and thence over a Broderick & Bascom two-bucket tramway, using 10-cu. ft. buckets, 1,400 ft. to the main terminal of the large tramway at the 800 level. This "jig-back" tramway has a capacity of about 75 tons in 8 hours. The buckets are automatically discharged at the 800 level bins. One man is employed in its operation. In addition, the customary bunk houses and cook house are installed at this level.

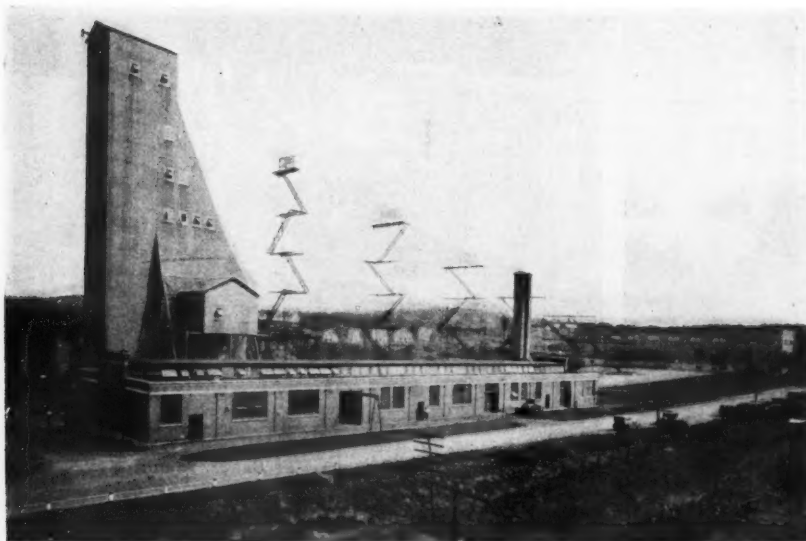
Ore is transported from the 800 level terminal over a 1,500-ft. Broderick & Bascom friction grip tramway, using 6-cu. ft. buckets, with 18 buckets on the line. This tramway is started by a 20-hp. 2,200-volt Westinghouse motor, which also acts as a brake and holds the tramway at constant speed. Spacing of the buckets is controlled by bell signals at each terminal. This tramway has a capacity of approximately 150 tons in eight hours. Ore is dumped at the lower terminal into a 200-ton receiving bin at the head of the concentrator.

CONCENTRATOR EQUIPMENT AND FLOW SHEET. The concentrator of the Harmony Mines has a capacity at present of approximately 150 tons in 24 hours. The building is 175 ft. in length and 52 ft. wide in the widest part. It is of heavy wood construction requiring approximately one-half million feet of lumber

for its building. The building is steam heated throughout, steam being made in a 50-hp. fire tube boiler on the lower floor of the mill. Four-foot cord wood is used as fuel. Figure 2 gives a flow sheet of the mill as now used. It may not be remiss to state here that the average extraction last year, using this flow sheet was 98.91 percent.

Ore is discharged from the 200-ton receiving bin, by a coarse ore feeder of local design, onto a feeder belt and a 24-in. magnetic pulley for the removal of tramp iron. Thence over a grizzly, spaced 1½-in. Undersize to a Stephens-Adamson inclined, bucket elevator. Oversize through a 12 by 14 in. Universal jaw crusher, set at 1½-in.; thence joining the undersize in the boot of the bucket elevator. The product is delivered over the elevator to a 400-ton fine ore bin above the ball mill. The ore is fed from this bin by feed hopper and feed conveyor to the ball mill, a 7 by 36 in. Hardinge conical mill. The ball mill is driven by a 100-hp. General Electric slip ring motor through a silent chain drive.

At the feed end of the ball mill, P & E flotation oil is added as a collector, by a K & K oil feeder, in quantities of 12 to 14 drops per minute, depending on the grade of the ore. Ore is ground in the ball mill to all pass 60 mesh, although 60 percent will pass 100 mesh. The ball mill is operated in close circuit with a 4 ft. 6 in. by 18 ft. Dorr Duplex classifier. Classifier overflow goes direct to rougher flotation cell. Density of classifier overflow is controlled by valve governing quantity of clear water added at feed end of ball mill. Pine oil is added at the feed end of the rougher cell as a frothing agent, in quantity of 24 to 26 drops per minute. Two 14-ft. K & K single spitz rougher cells are used, manufactured by the Southwestern Engineering Company. Rougher concentrate goes direct to a 6-ft. single spitz, K & K (Continued on page 115)



Castile Mine headframe, shops building, hoist and compressor building



Stockpile system at the Montreal Mine

By W. H. Carrick

SAFETY ENGINEER,
CORRIGAN, McKINNEY STEEL CO.

ACCIDENT

in the

MINING work on the Gogebic Range is conducted by six companies, which, with three exceptions, comprise all the large operators of the Lake Superior District. These companies are: The Oliver Iron Mining Co., Pickands, Mather & Co., the M. A. Hanna Co., Oglebay, Norton & Co., the Republic Steel Corporation and the Corrigan, McKinney Steel Co.

From October 1, 1929, to October 1, 1930, there was an employment of 922,286 man days and 5,070,862 tons of iron ore were mined. During this same period there were a total of 116 compensable accidents and 15,197 compensable days, the latter figure including 9,000 compensable days for the five fatal accidents incurred.

The following table shows the fatalities per 1,000,000 tons of ore mined for the period 1904 to 1930, grouped in five-year periods:

Period	Tons Mined	Fatal Accidents	Rate
1904-1909	14,302,939	110	7.69
1909-1914	16,570,819	112	6.76
1914-1920	31,500,824	96	3.05
1920-1925	24,023,707	39	1.62
1925-1930	27,270,170	38	1.39

(Tonnage figures were used for the above compilation, the man days not being readily available for the entire period.)



Cage gate at an Incline Shaft

PREVENTION WORK

MINES of the GOGEBIC RANGE of MICHIGAN

There was a very decided drop in the fatal accident rate for the period 1914 to 1920, and the rate for the period 1925 to 1930 is only 45.5 percent of the rate for the period 1914 to 1920 and is 18.05 percent of the rate for the first period shown. The rate for 1914 to 1915 was the lowest, by far, of any previous year, but from 1915 to 1920 (the war years) the rate jumped upwards. From 1920 on the fatality rate dropped rapidly to a fairly steady rate. There can be no doubt but that the results attained are attributable to the accident prevention work that has gone on from the time of its birth but which took years of effort before appreciable results were shown. The rooting out of the causes of accidents and the determination of remedial measures has been a constant fight. Having determined the causes of accidents, the application of this knowledge to the prevention of similar accidents has been the second step and this path has been slow and difficult of progress.

All employees and those of the supervisory force must be advised of the source of past accidents and of the means determined for the prevention of similar accidents in the future. This brings us to the really hard part of all accident prevention work and that is the education of the employee. We are dealing with a class made up of a number of nationalities, experienced and inexperienced miners, old and young, some who can speak and understand the English language and some who cannot read or write but who can understand, fairly well, the spoken language.

It was fortunate for those in the early days of the safety movement that they did not have the number of diversions that we now have confronting us. In those days there were not the number of people owning automobiles nor did we have the numerous movies. About the only diversion that attracted men was fishing and hunting, so that if a Bureau of Mines car came around to give instruction, or a large safety rally was held, it was fairly easy to attract men to the meetings. It was something new, therefore worth while listening to.

Accident prevention work was new, and it was easily sold to some of the men because it was new. It is admitted that little was known about selling the idea to the men, for the men who were selling the idea, the safety men, knew very little more about safety than did the men whom they were trying to sell. Undoubtedly there was opposition to it on the part of a good many of the employees, there is to this day, and in most cases it was the old-timer who bucked the idea and said that this safety was foolishness. It was much easier to convince the younger man in the game that "there was gold in that 'ere safety" than it was the old-timer. I know of one mining captain who would have fired a man if he had caught him wearing a pair of gloves while doing work.

It wasn't just plain stubbornness that created this attitude, but it was more or less typical of the times. There were no compensation laws in those times, and a fatal accident was not considered especially serious. Very little attention was paid to an injury case. What really started safety was the creation of a legal system of compensation for the injured party or his dependents. Employers were the first to realize that at the rate established, compensation would amount to an appreciable part of the cost of mining a ton of iron ore.

The awakening was somewhat sudden, and the remedy to be applied was hard to arrive at. It meant a complete upheaval in the existing order of procedure and the training of the entire personnel of the mining industry to an attitude the opposite of what they had been used to. The old "take a chance" attitude had to be combatted, along with the attitude of "get out the dirt," no matter how many were injured or killed. A man had to be able to stand the "gaff," had to be a "he-man," and from some of the tales told there is little doubt but that the suffering and agony some of the early miners endured was terrible, and that they were real "he-men." There is convincing proof among some of our old-time miners, who have been in accidents, that the old "grin and bear it"

attitude has left its toll on their bodies and that they are suffering today from the lack of first aid attention and later medical care.

Thanks to the compensation laws this condition does not exist today. The wide-awake executive realizes that compensation does play an important part in his costs and that accident prevention work does pay. Unfortunately for the safety movement some of these same executives, and I am not speaking of those implied in the title of this paper, although recognizing the need for safety, were not ready to show those in a supervisory capacity below them that they were personally interested in accident prevention. They employed safety men, turned them loose, told them they wanted safety, and forgot their part in it. They turned over to the safety man one of the hardest jobs around the mine, the job of preventing accidents, with no power behind him but that of persuasion. The safety engineer was to size up the job, analyze accidents, investigate accidents to determine the contributing causes, and then turn around and make his recommendations to prevent a similar accident. On presenting his conclusions to the mine executive he was told, many times, to go and talk it over with "Cap." He was to present the facts, his findings and recommendations, to "Cap," who, in practically all cases, being along in years and a practical man from the ranks, would resent anyone but his superintendent coming around and suggesting to him how the job should be run and how a particular job should be done; when he probably had been mining when the safety man was still in knee pants.

Early day efforts along safety lines were very much as described above. Some executives recognized the difficulties encountered by these first safety men they placed on the job and got personally behind the safety movement, tried out new ideas, and encouraged and commanded their personnel all down the line.

There are some men that can be led into the ways of safety, some that have

to be driven to it and some that nothing can convince. Present day safety methods are based on the assumption that the best methods to secure maximum results in safety are discipline and education.

The principal efforts along the lines of education have been the issuance of rule books by the various companies, which specify how some classes of work shall be done and how it shall not be done. These safety rules, together with the application of discipline, have been the means of preventing many accidents. It has not, however, proved to be the complete solution of the problem of eliminating accidents. The use of bulletin boards and the posting of safety bulletins has been another educational means used. One mining company, operating two large mines, and who have the facilities for doing so, have put on safety plays. Several companies have made use of safety educational films. All of these ideas are good, for they help to develop, in each employee, a "safety consciousness" which is a step forward. Some of the companies hold short, snappy safety meetings just before the men go to work. The speaker may be the safety man, who describes an unusual type of accident of which he has heard, or who gives a short safety talk. It may be another official or an outside speaker who gives the talk. One company holds safety meetings underground, during the lunch hour.

Another line of educational endeavor which is finding favor, first tried out in the Southwest, is that of developing a standard, safe way of doing certain classes of work and of training the supervising force and employees in doing each class of work as specified. Where the personnel is well trained to follow out these specifications, and adhere closely to them, the human equation is largely eliminated from accident causation.

Several of the companies, who have more than one mine operating on the range, have inter-mine competitions, the one making the best record receiving cigars, pocket knives and other small articles, each employee receiving a prize. This is usually a monthly prize. One company, having several mines in the district, has grouped them into three groups and the group having the best record for the year receives a prize. This year the winning group received turkeys for every employee of the group. This same company is trying out another method, that of crediting each man on the payroll with a certain amount for each month that the mine goes without a lost-time accident. A 10-cent credit is given for the first month, 20 cents for the second month, 30 cents for the third month and 30 cents thereafter for each month that the mine operates with-

out a lost-time accident. The total for a year's operation would amount to \$3.30. At the end of the year the employees take a vote on what they wish to purchase, each man receiving the same article or one of possibly three or four chosen and bought. The purchases are made through the purchasing department of the mine. Any lost-time accident interrupts the system and it must be started all over again. Competitive campaigns are good, if they are honestly carried out, for they keep the matter of accident prevention before the men all the time. When each employee has developed "safety consciousness" to a point where it is functioning all the time, then accidents will stop.

One company pays a bonus of one shift's wages to each underground boss who goes through a month without having a lost-time accident to a man in his jurisdiction. The attitude in all these devices is to give the employee an object to think about, which is allied with safety, and thus stimulate safety. A monetary reward for a safety competition, even if the value is small, has much more attraction than just a competition for safety, without a reward.

Discipline, as meted out by the different companies, varies. Some companies give a warning for a first offense, a layoff of a week to two weeks for a second offense, and discharge for the third offense against the safety rules. This applies to more or less minor infractions, but where the infraction is of very serious nature it may even be a long layoff (one to two months) or even discharge. This would likely be where a gang of miners failed to guard their working place when blasting or failing to notify adjoining groups of a blast when they might be endangered, or disregarding traffic signals and injuring a fellow employee. Years of service is no bar to strict discipline, with one company, if the offense is serious. With most of the companies the disciplinary rules are mandatory with the supervising official and they have attained good results. With some of the companies discipline is not strict and its application is left to the judgment of the supervisory force.

The safety organization of the several companies varies. One large company has plant safety committees, a district safety committee and a general safety committee, which meets once a month. Selected committee members from the several districts form the general safety committee. With other companies the district safety committee is the highest body, the plant and department safety committees coming under it.

Another company holds a safety meeting once a month which is attended by the superintendent, the assistant superintendent, the safety engineer and all de-

partment heads and bosses. This system has an advantage over other systems in that each man in a supervisory capacity is there to answer any criticism directed at him and can offer any suggestions he may have. The meeting is preceded by a dinner.

All companies have taken measures to have all dangerous, moving parts of all machinery well guarded.

Trolley wire underground is guarded at chutes and ladders in practically all mines. Where crushing conditions and moving timber does not permit of permanent guards, temporary guards are used. These are made of old air hose which has been split, an all-rubber guard manufactured for the protection of line-men working on high tension wires and a split box (3 ft. 6 in. long and 3½ in. x 3½ in. in cross section) hinged and locked with a window latch, which is grooved 1 in. square, dried out, and thoroughly painted. The use of the temporary guard is mandatory where any employee, except an electrician, is working near the wire.

Branch haulageways and main haulageways are provided with a system of signal lights to govern train movements and avoid collisions.

Practically all companies have come to the use of protective wearing apparel such as hard hats, wire and glass goggles (either plain or corrected lenses), hard toe boots and shoes, gloves, asbestos clothing, masks for pouring hot metal, welding masks and goggles. Some companies permit only all-rubber, knee-length boots in mines, some companies permit the rubber shoe and others permit footwear with rubber bottoms and leather tops.

The practice in the handling of explosives is almost standard. Explosives are moved, by hand, on special, wood-lined trucks from the shaft to magazines. In some mines the power is cut off the trolley wire over the course used and in other mines the current is left on. Boxes of fuse are moved in a similar manner or on an ordinary timber truck. Caps are usually taken into the mine in the original container, of wood. Some mines have provided a special knapsack for the case, which is carried on a man's back. One mine has provided a set of heavy web straps, fastened to a stout leather handle. These straps go around the box and it is carried like a suitcase.

There are two different methods used for the distribution of explosives, fuse and caps. With one company the miners are issued a box of explosives, a roll of fuse and a box of caps, which are kept by the miner at his working place. The explosive is kept in one locked box and fuse and caps in another locked box which are kept a distance apart of 50 ft., as specified by law. In the other



Some miners at the Castile Mine, showing hard hats, safety belts, and No. 1 type of capped fuse container. An apparatus crew in training is shown on the right

system, which is commonly used, an experienced man is stationed at the magazines who issues explosives and capped fuses on a signed order from a boss. This man makes up all capped fuses. Explosives are carried from the magazine to the working place in cement sacks or in bags which are manufactured by the explosive companies. The latest and best practice for handling capped fuse is in special, metal containers. These are of two types, a flat cylindrical type with the lid hinged on or held with a strap, and a second type with the bottom round and the top square. The lid is hinged on the square end and in the carrying position the lid is on top making this can, in a wet place, waterproof. The first can is not waterproof. One company who uses the first type has had them made out of copper and another company has had them made out of galvanized iron and lined with roofing material. This second company found the first type unsatisfactory and there was an element of danger, in that three cases were brought to light where the miners had been careless and had caught a cap between the lid and the body of the can. Fortunately, the caps did not explode. The second type of container was then designed and it is considered to be much safer and is waterproof. This second type is also made out of galvanized iron and is lined with roofing material. These last containers are about 9 in. across, 10 in. deep and $3\frac{1}{2}$ in. thick.

Leather safety belts are used in mines with open stopes and in certain classes of work in shafts and raises.

The most modern of the shafts are provided with signal lights which indicate whether or not any of the shaft gates or doors are open, or closed, and whether or not the cage is in motion. The engineer can also tell from which level a signal is coming. All signals, on the engineer's stand and at all levels, are both visual and audible. Some of the shafts are so equipped that signals can

be given to the engineer from any point in the shaft. This proved extremely valuable in one case involving a mine fire where two men were in the upcast air shaft, which was so equipped. One company has been experimenting with a system of wired radio whereby anyone on the cage can talk to the engineer and the engineer can talk to the person on the cage. This system has many features of value.

Within the past three years there has been a great increase in the use of electricity underground. It formerly was confined to the pump and haulage systems, with a certain amount being used for lighting purposes. Today the field has been enlarged to include the moving of ore in the sublevels, moving of ore and rock in advancing drifts and crosscuts, lighting in sublevels and signalling between levels and sublevels. Today very little rock or ore is moved or handled by hand methods, for it is done either by mechanically operated shovels, electrically operated tuggers pulling ore or rock into raises, or operating on slides to load cars. This system has introduced some very grave hazards such as fires, electric shock and burns, infection from punctured wounds, injuries occasioned by moving heavy machinery, foreign particles in the eye, etc.

Some companies are operating these tuggers with alternating current and some with direct current electricity. Direct current electricity is probably the most used, but unless properly installed is considerably more of a menace than is alternating current, for in an unfused circuit an arc can be caused which will very easily start a fire, severely burn a man, or cause severe conjunctivitis. A hazard developed with the round, two-conductor, heavy rubber insulated cable, commonly used, which was not anticipated. It was found that if this cable were subjected to a severe squeeze, or hard blows, that the insulation between the two wires, which are twisted and crossed, broke down and an

arc was formed which burned out the cable. This has been the cause of interrupted operation and also the cause of several fires. In practically all cases this destruction of the insulation was not apparent on the exterior insulation of the cable. A cable is now favored where the two wires run parallel. Particular care is also taken to see that all cable is properly suspended from timbers and in such position that they cannot be squeezed.

The introduction of tuggers increased the hazard of punctured wounds because of the wire cables fraying. This hazard has been met by the use of leather gloves. A great many different kinds have been tried out. The use of mecurochrome compresses has undoubtedly been the means of preventing much infection from this source.

A number of accidents have been caused by improper fastening of the sheave block in the breast of the working place. This class of accidents has been overcome by the use of wire rope slings or strong, steel hooks, fashioned after a cant hook, which are driven into a timber. Chains are not to be relied upon for this purpose.

The use of electric tuggers in the sublevels made it possible to have much better lighting than was formerly possible, and this is a good safety measure.

Another feature being emphasized is "good housekeeping." Most all companies are appreciating that this is a good safety stimulus and are stressing it. Aside from the fact that it makes the working place neat, it makes for increased efficiency, makes for safety in that it prevents stumbling accidents, but greatest of all the men realize, or are made to understand, that it is a safety measure and consequently they have safety in mind a large part of the time.

Physical examination of men entering employment is practiced by all companies. Some companies are having periodic physical examinations of all employees, not with (Continued on page 108)

The COPPER INDUSTRY in 1930

THE copper industry in 1930 was severely affected by the general world-wide industrial depression. Production and consumption, which made new high records in 1929, dropped sharply, according to the United States Bureau of Mines.

Although production and consumption in 1930 both were at a rate far below 1929, the decline in production lagged behind that in consumption, causing a substantial increase in stocks. Estimated stocks of refined copper at domestic refineries at the end of the year were the largest on record. Blister stocks, which first reflect any change in rate of production, were materially lower at the end of 1930 than at the end of 1929.

Falling consumption and increasing stocks were accompanied by a severe drop in the price of refined copper. The price held at 17.77½ cents a pound at refinery from the middle of April, 1929, to the middle of April, 1930, when it dropped 4 cents. This drop was followed by numerous others which brought the price to a low for the year of 9.27½ cents a pound on October 23. The price jumped from 9.27½ cents a pound on November 11 to 11.40 cents a pound on November 15 and immediately started to drop again. On December 15 it was 9.77½ cents and on December 23 it was 10.07½ cents. Imports of unmanufactured copper established a new high record in 1929 while exports of metallic copper decreased; in 1930, for the first time in 50 years, imports exceeded exports.

The smelter production of copper from domestic ores in 1930, as determined by the Bureau of Mines from reports of the smelters showing actual production for 11 months and estimated production for December, was 1,375,000,000 pounds, compared with 2,003,000,000 pounds in 1929. The 1930 production is 31 percent lower than that of 1929, and is the smallest production recorded since 1922. The estimated smelter production from domestic ores for December as reported by the smelters, was approximately 100,000,000 pounds which is about 16,000,000 pounds lower than the average for the 11 months preceding.

The production of new refined copper from domestic sources, determined in the same manner as smelter production, was about 1,485,000,000 pounds, compared with 1,983,000,000 pounds in 1929. In 1930 the production of new refined copper from domestic and foreign sources amounted to about 2,230,000,000 pounds, compared with 2,740,000,000 pounds in 1929—a decrease of 510,000,000 pounds

or 19 percent. The production of secondary copper by primary refineries dropped from 334,000,000 pounds in 1929 to about 250,000,000 pounds in 1930, or a decrease of 84,000,000 pounds. Thus the total primary and secondary output of copper by the refineries was 19 percent lower in 1930 than in 1929, being about 2,480,000,000 pounds in the past year compared with 3,074,000,000 pounds in 1929.

The imports of unmanufactured copper during the first 11 months of 1930, according to the Bureau of Foreign and Domestic Commerce, amounted to 762,913,189 pounds, a monthly rate of 69,000,000 pounds, compared with 974,312,201 pounds for the entire year 1929, a monthly rate of 81,000,000 pounds. Imports in November totaled 57,000,000 pounds. The total imports for 1930 will very likely show a decrease in quantity of approximately 151,000,000 pounds for the year, or a drop of about 15 percent.

The exports of metallic copper during the first 11 months of 1930 amounted to 691,282,979 pounds, compared with 992,895,119 pounds exported during the entire year 1929. If the exports of metallic copper in December equal the monthly average for the first 11 months of the year, nearly 63,000,000 pounds, the total for 1930 will be about 754,000,000 pounds. Exports in November, however, amounted to about 77,000,000 pounds and it is likely, therefore, that the total for the year will be nearer 764,000,000 pounds. In the first 11 months of 1930, 619,679,098 pounds of refined copper in ingots, bars, rods and other forms were exported. Of this quantity the United Kingdom received 158,945,101 pounds, the highest amount; France was next with 129,135,216 pounds; Germany was third with 82,960,335 pounds; and Italy fourth with 78,774,889 pounds. In the entire year 1929 the United Kingdom received the largest amount, 207,162,835 pounds; Germany was next with 178,951,566 pounds; France was third with 177,765,152 pounds; and Italy fourth with 84,805,254 pounds. Exports of refined copper to France, (Continued on page 107)

The LEAD INDUSTRY in 1930

THE domestic lead industry was less severely affected by the world-wide industrial depression of 1930 than either the copper or the zinc industry, according to the Bureau of Mines.

The output of lead from domestic sources was 15 percent lower than in 1929, while copper and zinc showed decreases of 25 and 20 percent, respectively. Estimated withdrawals of lead from the total supply available for consumption were only 16 percent less than in 1929, whereas withdrawals of both copper and zinc for domestic consumption were approximately 28 percent less.

The output of primary lead from domestic sources was the smallest recorded since 1924 and that from domestic and foreign sources the smallest since 1923. Indicated domestic withdrawals were lower than in any year since 1923; exports of refined lead and imports of lead in ore, base bullion, etc., were lower than in any year since 1922.

The output of primary domestic desilverized lead in 1930 was about 324,000 tons; of soft lead about 200,000 tons, and of desilverized soft lead about 45,000 tons, making a total output from domestic ores of about 569,000 tons of refined lead. Corresponding figures in

1929 were 381,487 tons of desilverized lead, 235,345 tons of soft lead, and 55,666 tons of desilverized soft lead, making a total of 672,498 tons. The output of lead smelted and refined from foreign ore and bullion was about 72,000 tons, as compared with 102,135 tons in 1929. The total primary lead smelted or refined in the United States in 1930 was thus about 641,000 tons, as compared with a total of 774,633 tons in 1929, a decrease of about 17 percent. The output of primary antimonial lead in 1930 was about 11,000 tons, as compared with 25,669 tons in 1929.

The imports of refined pig lead for 11 months amounted to 240 tons. The base bullion imported during the same period contained 36,758 tons of lead, of which 18,815 tons was from Mexico and 17,943 tons from Peru. The exports of lead during the first 11 months amounted to 46,532 tons, as compared with 73,251 tons exported in the entire year 1929. By excluding the stocks of lead at smelters and refineries and by estimating the amount of lead exported with benefit of drawback (for which figures are not available) the new supply of lead made available for consumption in 1930 is calculated at about 583,000 tons, a decrease of 16 percent from 692,765 tons in 1929.

The average price for lead at New York (outside market) was unchanged at 6.25 cents a pound during January and all but the last two days of February. The average monthly price dropped steadily to 5.23 cents in July, rose to 5.49 cents in September, and dropped again to a low for the year of 5.10 cents in November and December. The price held at 5.10 cents from October 10 to the end of the year. There was considerably less fluctuation in the price of lead in 1930 than in the prices of silver, copper or zinc.

NEW REFINED COPPER WITHDRAWN FROM TOTAL YEAR'S SUPPLY ON DOMESTIC ACCOUNT, 1929-1930, IN POUNDS

	1929	1930
Refinery production of new copper from domestic sources.....	1,983,000,000	1,485,000,000
Refinery production of new copper from foreign sources.....	767,000,000	745,000,000
Imports of refined copper (December, 1930, estimated).....	134,000,000	89,000,000
Stocks of new refined copper on January 1.....	114,000,000	306,000,000
	2,988,000,000	2,625,000,000
Exports of refined copper, ingots, bars, rods or other forms (December, 1930, estimated).....	903,000,000	681,000,000
Stocks December 31.....	306,000,000	667,000,000
	1,209,000,000	1,348,000,000
Total withdrawn on domestic account.....	1,779,000,000	1,277,000,000

ZINC in 1930

LOW industrial demand throughout the world in 1930 was reflected in the zinc industry in the United States, according to the Bureau of Mines.

Production of primary zinc from domestic and foreign sources and apparent deliveries for domestic consumption were lower than in any year since 1922. Stocks of metallic zinc at smelters and at electrolytic refineries were nearly doubled during 1930 and at the end of the year they were the highest on record. In 1930 the exports of slab zinc, which have declined sharply and, with only one exception, steadily since 1925, were less than one-half of exports in 1929 and were only slightly more than 10 percent of exports in 1925.

The output of primary metallic zinc from domestic ores in 1930, as reported by producers from figures of actual production for 11 months and estimates for December, was about 491,100 tons and that from foreign ores was about 8,200 tons, a total of 499,300 tons. In comparison with 612,136 tons from domestic ores and 13,311 tons from foreign ores, a total of 625,447 tons in 1929, the decrease in total primary production for 1930 amounted to 20 percent. In addition to the output of primary zinc, about 34,800 tons of redistilled secondary zinc was produced, as compared with 47,348 tons in 1929. Thus the total supply of distilled and electrolytic zinc in 1930 was about 534,100 tons, composed of 161,500 tons of high grade, 21,600 tons of intermediate, 94,600 tons of select and brass special, and 256,400 tons of prime western zinc. Of the total output of primary zinc in 1930, 132,000 tons was electrolytic zinc. Of the primary retort

output, 102,000 tons was produced in Pennsylvania, 94,000 tons in Illinois, 80,700 tons in Oklahoma, and the remainder in Arkansas, Indiana, Kansas, Texas and West Virginia.

The imports of slab zinc, including a small quantity of scrap and old, amounted to 291 tons for the first 11 months. The exports of slab zinc amounted to 7,482 tons, including 4,209 tons of rolled zinc. The stock of zinc reported at smelters and electrolytic refineries November 30 was about 165,000 tons. Apparent deliveries of primary slab zinc to domestic consumers in 1930 amounted to about 412,100 tons, a decrease of 28 percent from the 568,525 tons reported for 1929.

A total number of about 107,100 retorts was reported at the 21 zinc smelters that operated during all or a part of the year. Of that number, about 38,000 were reported in operation at the end of November. Only a little more than one-third of retort capacity at the 21 smelters, or about 37,700 retorts, was expected to be in operation at the end of the year.

According to trade journals, the average monthly price of prime western zinc at St. Louis was 5.24 cents a pound in January. From this figure it declined steadily to 4.33 cents a pound in July, rose to 4.36 cents in August and dropped again to a low for the year of 4.06 cents in October. The average for December was about 4.09 cents and on December 29 the price was 4.12½ cents. The average quoted price for 1929 was 6.49 cents a pound. The average selling price of all grades of zinc in 1929, as reported to the Bureau of Mines by producers, was 6.6 cents a pound.

tons containing 169,121 tons of metallic manganese in the entire year of 1929; Brazil furnished 163,848 tons containing 70,678 gross tons of metallic manganese during the first 11 months of 1930, as compared with 216,535 gross tons containing 93,961 gross tons of metallic manganese during all of 1929; imports received from India amounted to 50,500 gross tons containing about 26,228 tons of metallic manganese during the first 11 months of 1930, as compared with 72,940 tons containing 37,479 tons of metallic manganese in 1929; while British West Africa (Gold Coast) furnished 87,091 gross tons of ore containing 42,078 tons of metallic manganese for the first 11 months of 1930, as compared with 33,593 tons containing 16,058 tons of metallic manganese for the entire year of 1929. The sharp increase in importations from the Gold Coast and the decreased imports from Russia, Brazil, and India are noteworthy.

The production of steel in 1930 is estimated at 41,320,000 tons, in comparison with 56,433,473 tons in 1929, which accounts for the decreased demand for ferromanganese and in turn for manganese ore during the past year. The production of ferromanganese in 1930 is estimated at approximately 280,000 tons (262,242 tons for 11 months), compared with 339,205 tons in 1929. The rate of consumption of manganese ore in the manufacture of ferromanganese, as reported for 1929 by ferromanganese producers, was 1.894 tons of ore per ton of product.

The total metallurgical requirements of the United States in 1930 were probably in the neighborhood of 620,000 tons of manganese ore.

Shipments of domestic ore containing from 10 to 35 percent of manganese (feruginous manganese ore) in 1930 were 84,000 gross tons, valued at approximately \$592,000, as compared with 78,191 tons, valued at \$451,843 in 1929. The domestic shipments of ore containing from 5 to 10 percent of manganese (manganiferous iron ore) in 1930 were 592,000 tons, valued at \$807,000, as compared with 1,110,067 tons, valued at \$2,822,623 in 1929.

MANGANESE in 1930

THERE was an increase of about 11 percent in shipments of manganese ore containing 35 percent or more of metallic manganese from domestic mines in 1930. The total was approximately 67,000 gross tons, valued at \$1,454,000, as compared with 60,379 gross tons, valued at \$1,612,357 in 1929, according to the Bureau of Mines. The shipments of metallurgical ore in 1930 amounted to about 55,800 gross tons, valued at \$1,040,000, as compared with 47,597 gross tons, valued at \$1,036,199 in 1929. Chemical ore shipments decreased from 12,782 gross tons, valued at \$576,158, in 1929, to about 11,200 gross tons, valued at \$414,000, in 1930.

The increase in 1930 was mainly due to the increased shipments of concentrates from the plants of the Georgia Manganese & Iron Co., at White, Ga., and the Hy-Grade Manganese Production & Sales Corp., at Star Tannery, Va., and to the shipments to consumers of crude rhodochrosite from the Emma mine, at Butte, Mont. The plant of the Domestic Manganese & Development Co., at Butte, Mont., which sintered rhodo-

chrosite from the Emma mine of the Anaconda Copper Mining Co., was closed June 30, 1930, and consequently the production and shipments of sinter were substantially smaller than in 1929. Shipments of high-grade metallurgical ore from Arkansas were 3,300 tons in 1930; from Georgia, 19,800 tons; from Montana, 24,100 tons; and from Virginia, 3,500 tons. These four states therefore contributed 50,700 tons of metallurgical ore, or 91 percent of the total.

During the first 11 months of 1930 the United States imported 528,747 gross tons of ore containing 251,691 gross tons of metallic manganese. Assuming that the imports for December were at the same rate as in November, the total tonnage imported would be approximately 550,000 gross tons containing 262,000 gross tons of metallic manganese, as compared with 664,269 gross tons of ore containing 323,415 tons of metallic manganese during 1929. The imports from Soviet Russia for the first 11 months amounted to 206,039 gross tons of ore containing 102,440 gross tons of metallic manganese, compared with 329,336 gross

COPPER IN 1930

(From page 106)

Germany and Italy in November, 1930, were at a rate considerably above the average monthly rate, whereas exports to the United Kingdom were at a rate considerably under the average monthly rate. When figures for December are added, exports to Germany will be only a little more than one-half of exports in 1929, those to the United Kingdom and France will show decreases of nearly 20 percent for each country, but exports to Italy will show an increase approximating 6 percent.

Refineries reported that at the end of 1930 approximately 667,000,000 pounds of refined copper would be in stock, more than double the reserve of 306,000,000 pounds at the end of 1929. The latter quantity, in turn, was well over two and one-half times the amount on hand at the end of 1928. It is estimated that stocks of blister copper at the smelters, in transit to refineries, and at refineries, and materials in process of refining, would be about 371,000,000 pounds on December 31, compared with 500,000,-

000 pounds at the end of 1929, a decrease of 129,000,000 pounds. Total smelter and refinery stocks at the end of 1930 were 1,038,000,000 pounds, representing an increase of 232,000,000 pounds over stocks at the end of 1929, but 86,000,000 pounds less than the record stocks of 1920.

The quantity of new refined copper withdrawn on domestic account during the year was about 1,277,000,000 pounds, compared with 1,779,000,000 pounds in 1929, a decrease of 502,000,000 pounds or 28 percent. The method of calculating domestic withdrawals is shown in the table on page 106.

stocks of iron ore in this group of states increased from 119,056 gross tons in 1929 to 328,000 tons in 1930. The average value of the ore in these states in 1930 per gross ton was \$3.61; in 1929 it was \$3.24. Most of this ore is magnetite.

WESTERN STATES

The Western States that ordinarily produce iron ore, named in order of their importance, are Wyoming, Utah, New Mexico, Colorado, and Washington. Occasionally Arizona, California, Idaho, Montana, and Nevada contribute small quantities. In 1930 the Western States mined and shipped approximately 799,000 gross tons of iron ore, valued at \$1,168,000. The ore comprises hematite, magnetite, and brown ore.

IMPORTS AND EXPORTS

The imports of iron ore reported for the 11 months ended November 30, 1930, amounted to 2,599,204 gross tons, valued at 7,676,638, or \$2.95 a ton. The imports for the year 1929 were 3,139,334 gross tons, valued at \$8,145,354, or \$2.59 a ton. The reported exports of iron ore for the 11 months ended November 30, 1930, amounted to 752,082 gross tons, valued at \$2,733,423, or \$3.63 a ton, as compared with exports for the entire year 1929 of 1,304,417 tons, valued at \$4,774,842, or \$3.66 a ton.

IRON ORE INDUSTRY Records Decrease in Output and Value

THE iron ore mined in the United States in 1930, exclusive of ore that contained 5 percent or more of manganese in the natural state, is estimated by the Bureau of Mines at 58,359,000 gross tons, a decrease of 20 percent as compared with that mined in 1929. The ore shipped from the mines in 1930 is estimated at 55,094,000 gross tons, valued at \$145,888,000, a decrease of 27 percent in quantity and of 26 percent in total value as compared with the figures for 1929. The average value of the ore per gross ton at the mines in 1930 is estimated at \$2.65; in 1929 it was \$2.61. The stocks of iron ore at the mines, mainly in Michigan and Minnesota, apparently increased from 7,067,206 gross tons in 1929 to 10,430,000 tons in 1930, or 48 percent.

The Bureau of Mines estimates are based on preliminary figures furnished by producers who in 1929 mined about 99 percent of the total iron ore. They show the totals for the principal iron-ore producing states, and, by grouping together certain states, the totals for the Lake Superior district and for groups of Southeastern, Northeastern, and Western States.

LAKE SUPERIOR DISTRICT

About 84 percent of the iron ore shipped in 1930 came from the Lake Superior district, in which approximately 49,378,000 gross tons was mined and 46,411,000 tons was shipped. These to-

tals exclude manganiferous ores amounting to approximately 801,500 gross tons in 1930 and 1,058,953 tons in 1929 that contained 5 percent or more of manganese in the natural state. The former ore is chiefly hematite. The stocks of iron ore in this district apparently increased from 6,108,499 gross tons in 1929 to 9,175,000 tons in 1930, or 50 percent. The average value of the ore at the mines in the Lake Superior district in 1930 was \$2.72 a ton; in 1929 it was \$2.68.

SOUTHEASTERN STATES

The Southeastern States, in which the Birmingham district is the largest iron-ore producing area, mined approximately 5,937,000 gross tons of iron ore in 1930, a decrease of 13 percent as compared with 1929. The ore is mainly hematite; brown ore and magnetite come next in order. The average value of the ore produced in these states in 1930 per gross ton was \$1.94; in 1929 it was \$1.96. The stocks of iron ore at the mines in this group of states, mainly in the Birmingham district, increased from 827,486 gross tons in 1929 to 914,000 gross tons in 1930.

NORTHEASTERN STATES

The Northeastern States, which include the Adirondack district, New York, and the Cornwall district, Pennsylvania, in 1930 mined 2,245,000 gross tons of iron ore, an increase of 2 percent. The

ACCIDENT PREVENTION

(From page 105)

the idea of eliminating employees who may have developed defects,

but with the idea of advising an employe of his condition, of having him treated and putting him on a job for which he is physically fitted.

One company is referring back to a man's physical examination record, when he is injured, to see if there is a possible connection between his physical condition and the accident.

The range is well equipped to take care of an emergency where the use of breathing apparatus would be necessary. If there is a serious emergency the companies of the range would act as a unit to overcome the trouble, as has been proved in the past. There are 40 sets of self-contained oxygen breathing apparatus on the range, all of the automatic feed type. In addition there are over 60 All-Service gas masks, with probably close to 300 extra canisters. Ample extra parts and supplies are carried as well as allied apparatus, such as inhalators, carbon monoxide detectors, etc.

One company has had all their employees, at their two mines, trained in first aid. Other companies have trained a considerable number of their employees.

Accident prevention work is receiving a great deal of attention on the Gogebic Range and is making good progress, as is evidenced by the fewer fatalities each year, the fewer number injured and the lessening of the severity of the accidents.

ESTIMATES OF IRON ORE MINED AND SHIPPED IN THE UNITED STATES IN 1930 AND ACTUAL OUTPUT IN 1929

District	Ore mined (gross tons)		Ore shipped			
	1929	1930	1929 Gross tons	1929 Value	1930 Gross tons	1930 Value
Lake Superior:						
Michigan	15,456,397	13,668,000	16,838,568	\$47,597,976	11,262,000	\$32,248,000
Minnesota	45,760,858	34,385,000	46,470,243	121,776,312	34,000,000	90,598,000
Wisconsin	1,608,571	1,325,000	1,789,721	4,848,978	1,149,000	3,180,000
	62,825,826	49,378,000	65,098,532	\$174,223,266	46,411,000	\$126,026,000
Southeastern States:						
Alabama	6,453,075	5,710,000	6,637,299	12,575,113	5,607,000	10,586,000
Georgia	59,316	53,000	59,316	175,145	53,000	149,000
Missouri	168,934	127,000	171,456	661,055	127,000	482,000
North Carolina	30,675	.....	30,675	106,411	.....	.....
Tennessee	102,171	28,000	101,796	234,827	28,000	75,000
Virginia .....	.....	19,000	232	631	36,000	57,000
	6,814,171	5,937,000	7,000,674	\$13,753,182	5,851,000	\$11,349,000
Northeastern States:						
New Jersey	281,327	390,000	285,115	1,157,848	387,000	1,686,000
New York	822,261	890,000	875,564	3,941,985	752,000	3,647,000
Pennsylvania	1,092,013	965,000	1,151,130	2,382,839	894,000	2,012,000
	2,195,601	2,245,000	2,311,809	\$7,482,672	2,033,000	\$7,345,000
Western States	1,192,122	799,000	1,191,719	1,689,520	799,000	1,168,000
Grand total ...	73,027,720	58,359,000	75,602,734	\$197,148,640	55,094,000	\$145,888,000

MINERAL PRODUCTION of Western States in 1930

ARIZONA

THE value of gold, silver, copper, lead, and zinc produced by mines in Arizona in 1930 was about \$76,095,000, a decided decrease from \$155,067,133 in 1929, according to estimates made by C. N. Gerry and Paul Luff, of the Bureau of Mines. A pronounced decrease was shown in the output of all five metals and the decrease in copper was more than the copper output of Montana in 1930. On account of the decreased metal production and the greatly decreased metal prices of silver, copper, lead, and zinc, the value of each metal was also distinctly less than in 1929. Nearly all the large producers of copper reported a greatly decreased output in 1930 and several companies reported as much as a 50 percent decrease. Arizona, however, was again by far the largest producer of copper in the United States and it exceeded all other States in the total value of the five metals. There was a large decrease in the output of gold corresponding to the abnormal decrease in the output of copper, but the increase in gold from gold ore in Mohave County was notable. There was also an unusually large decrease in the silver output, which in general follows the trend of copper. The production of lead and zinc, although relatively unimportant in Arizona, was much less than in a normal year. Large expenditures were made in improvements at the copper smelters, in installing new mine equipment, and in building new mills, especially at the United Verde Extension mine at Jerome, the Swansea mine near Bouse, and the Three "R" property near Patagonia.

The gold output decreased from \$4,182,287 in 1929 to about \$3,514,000 in 1930 due to the marked curtailment in the output of copper ore. Decided decreases were made in the production of gold from the United Verde, Copper Queen, Calumet & Arizona, Arizona Eastern, New Cornelia, Morenci property of the Phelps Dodge Corporation, MacNeill, and United Verde Extension properties. An unusually large increase, however, was recorded from the Tom Reed mine at Oatman, in Mohave County. Seven companies each produced more than \$170,000 in gold in 1930—United Verde, Tom Reed, Calumet & Arizona, Copper Queen, United Verde Extension, New Cornelia, and Magma properties. Considerable gold was also produced from the Shattuck Denn property near Bisbee, the old Dominion mine at Globe, and from the Morenci property of the Phelps Dodge Corporation.

The silver output decreased from 7,543,283 ounces in 1929 to about 5,300,000 ounces in 1930, and the value from \$4,020,570 to about \$2,040,000 as the average price of silver decreased from 53.3 cents an ounce in 1929 to 38.5 cents an ounce in 1930. The output of silver in 1930 was the smallest since 1922, but the State again ranked fourth in the production of silver after Utah, Idaho, and Montana. The United Verde mine continued to exceed all other mines in the State as a producer of silver, but its output in 1930 was much less than that in 1929. Other large producers of silver, in order of their output, were the Calumet & Arizona, Magma, United Verde Extension, Copper Queen, Shattuck Denn, Montana (Eagle-Picher Lead Co.), and New Cornelia mines.

The copper output decreased from 830,628,411 pounds in 1929 to about 564,500,000 pounds in 1930, and the value from \$146,190,600 to about \$70,000,000. As the average price of copper decreased from 17.6 cents a pound in 1929 to 12.4 cents in 1930, mines in Arizona decreased their output decidedly and the production of copper was the smallest since 1922. The copper output of the United Verde, Copper Queen, Inspiration, New Cornelia, Nevada Consolidated (Ray mines), United Verde Extension, Morenci property of the Phelps Dodge Corporation, and Calumet & Arizona mines was far below normal. In spite of the general decrease, the production of copper from the Miami and Christmas properties was much more than that of 1929. As in 1929, eight copper smelting plants within the State were active throughout the year and the plant at Humboldt was operated until May. Instead of shipping all copper bullion East for treatment, a refinery was completed and operated at El Paso, Tex., chiefly to treat the output of the Calumet & Arizona Mining Company and the Phelps Dodge Corporation. The largest copper producers in 1930 were the United Verde, Copper Queen, Miami, Inspiration, New Cornelia, United Verde Extension, Calumet & Arizona, Morenci, Nevada Consolidated (Ray mines), Magma, Old Dominion, Shattuck Denn, and Christmas mines. The construction of the 200-ton flotation mill of the United Verde Extension Mining Company at Clemenceau was completed and began regular operations on full time in July. A new mill was also completed and operated at the Swansea mine in Yuma County.

The lead production in Arizona decreased from 16,054,122 pounds in 1929 to about 9,000,000 pounds in 1930, and

the value from \$1,011,410 to about \$468,000. As the average price of lead decreased from 6.3 cents a pound in 1929 to 5.2 cents a pound in 1930, nearly all the large producers of lead in Arizona curtailed shipments of lead ore and concentrates and the output was less than any since 1921. The 79 mine at Hayden Junction, in Gila County, was again the largest lead producer in Arizona, but its output was less than half that of 1929 and the property was closed in October. It was followed by the Montana mine of the Eagle-Picher Lead Company at Ruby, in Santa Cruz County, which was closed in April, the Tombstone Extension property near Tombstone in Cochise County, the World's Fair mine near Patagonia, in Santa Cruz County, and the Copper Queen mine at Bisbee, in Cochise County. The MacNeill mine near Wickenburg, in Maricopa County, which ranked fourth as a producer of lead in Arizona in 1929, was closed in January. The lead smelter of the Phelps Dodge Corporation was operated throughout the year, treating chiefly lead ore from the 79, Tombstone Extension, and Copper Queen mines.

The output of zinc, recovered chiefly from mines in Santa Cruz County, decreased from 2,458,580 pounds in 1929 to about 1,545,000 pounds in 1930, and the value from \$162,266 to about \$73,000. The decrease in zinc was due to the early closing of the flotation mill of the Eagle-Picher Lead Company, operating the Montana mine at Ruby.

ALASKA

THE Alaskan branch of the Geological Survey estimates that mines in Alaska produced minerals to the value of \$13,602,000 in 1930 as against \$16,066,000 in 1929. The total value of the mineral output of Alaska since 1880 is approximately \$629,000,000. The figures for 1930 are preliminary estimates and consequently subject to revision. The source of this mineral wealth was approximately as follows:

VALUE OF MINERAL OUTPUT OF ALASKA
IN 1930 AND 1929

	1930	1929
Gold	\$8,394,000	\$7,761,000
Copper	4,100,000	7,130,000
Silver	158,000	252,000
Coal	609,000	528,000
Other minerals (lead, petroleum, marble, tin, platinum, etc.).....	341,000	395,000
	\$13,602,000	\$16,066,000

The total production of gold from Alaska mines in 1930 is estimated at \$8,394,000, or about two-thirds of a million dollars more than in 1929. This marks a noteworthy increase, not only over the preceding year, but over any of the preceding ten years. By far the largest amount of gold appears to have come from the placer mines, which yielded about 57 percent of the total gold, as against 43 percent from the lode mines. During the entire period that gold mining has been in progress in Alaska about \$390,000,000 has been won, of which almost exactly two-thirds has come from placer deposits and one-third from lodes.

The bulk of the increase in production of gold appears to be attributable mainly to the increased operation of the placer mines, especially those of the Fairbanks

Exploration Company, in the Fairbanks district of central Alaska, where the large mining enterprise on which preparatory work had been in progress for several years came into full operation and its five dredges were continuously mining throughout the open season. Most of the placer gold is now recovered by dredging, and the more primitive hand methods or simpler mechanical devices have largely disappeared except in the more remote districts. It appears that about 80 percent of the placer gold that was recovered in 1930 was mined by dredges; in 1929 the ratio was about 71 percent. The bulk of the lode gold continued to come from the properties of the Alaska Juneau Gold Mining Company, in the Juneau region of southeastern Alaska.

The value of the copper produced from Alaska in 1930 is estimated to have been \$4,100,000. This marks a decrease in value of more than \$3,000,000 from the corresponding value in 1929. Nearly \$1,750,000 of this decrease may be attributed directly to the lower average price of copper in 1930 than in 1929. The low price not only had its direct effect in the value of the output, but it also acted to retard operations so that the quantity produced also fell off by an amount estimated as in excess of 7,000,000 pounds. In 1930, as in former years, practically all the copper came from two mines near Kennecott, in the Copper River region, and from one mine in the Prince William Sound region.

Search for new ore bodies and for extensions of the known ore bodies has been continued at all the producing mines, but the general business depression and the low price of all the base metals or the failure to obtain encouraging returns have caused the abandonment of several new prospecting projects that had been started in the preceding year. According to current report one of the three Alaska copper mines that has been a large producer in the past, the Beatson mine of the Kennecott Copper Corporation, on Latouche Island, discontinued operations on December 1, and the task of dismantling its surface plant has been started.

Most of the silver produced in Alaska during recent years has been recovered from the copper ores—in fact, during 1929, the latest year for which complete reports are available, over three-quarters of the silver came from that source. With the reduction in the output of copper ore in 1930 the quantity of silver naturally shows a corresponding decrease. Nowhere in Alaska are ores mined primarily for their silver content. Silver-bearing lead ores are known at several places in the Territory, but the high cost of transporting and smelting them discourages development or even search for them except in the more accessible parts of Alaska.

The production of coal from Alaska mines in 1930 is estimated to have been 116,000 tons, or somewhat more than 1929 and within a few thousand tons of the high record of all time that was established in 1928. As usual practically all of the output came from the Matanuska and Healy River fields. The principal producing mines were those of the Alaska Matanuska Coal Company, the Evan Jones Coal Company, in the Moose Creek district of the Matanuska field, and the Suntrana mine of the Healy

River Coal Corporation in the Healy River field.

In addition to the mineral products already mentioned, Alaska also produced during 1930 some lead, marble, limestone, tin, quicksilver, and platinum. The aggregate value of the output of these minerals in 1930, together with that of petroleum, is estimated to have been \$341,000. Most of the lead was obtained as a by-product from the gold ores of the Alaska Juneau mine.

CALIFORNIA

TOTAL value of the gold, silver, copper, and lead produced from placer and lode mining in California in 1930, is estimated at \$13,007,300, or a decrease of approximately \$2,083,300, compared with 1929, according to preliminary figures prepared by Victor C. Heikes, of the Bureau of Mines. Gold, silver, and lead all showed increases in output compared with 1929, but copper declined in yield owing to the drop in price of the metal and the consequent curtailment of production. No recovery of zinc was reported in 1930.

The value of the gold recovered from lode and placer mining in California in 1930 is estimated at \$9,033,600, compared with a value of \$8,526,703 in 1929. This is an increase of approximately 24,500 fine ounces in quantity and about \$506,900 in value over the yield in 1929. Gold from lode mines increased, with practically all of the larger gold mines showing a gain in output. Placer mining, largely confined to dredging operations, will again show a decrease in gold yield, but active mining of copper ore during the first half of the year helped to increase the gold output.

The silver output from mines in California in 1930 is estimated at \$1,448,000 fine ounces, valued at \$557,500, an increase of approximately 271,100 fine ounces in quantity and a decrease of about \$69,800 in value as compared with 1929. The mining of silver-lead ores in Inyo County and of silver ore in Napa County were the chief sources of the increased yields of silver, though some gain was also made from the mining of copper ore, particularly in Plumas County.

The yield of copper from mines in California in 1930 is estimated at 26,113,000 pounds, valued at \$3,238,000, a decrease of approximately 7,106,000 pounds in quantity and of about \$2,608,500 in value, compared with 1929. At the end of 1930 only two of the principal copper mines in the state were in operation and one of these, the Mountain Copper Co., was diverting its operations from its copper properties to its gold-bearing gossan deposits.

The output of lead from mines in California in 1930 is estimated at 3,427,000 pounds, valued at \$178,200, an increase of approximately 1,997,500 pounds in quantity and of about \$88,200 in value, compared with 1929. The principal producer of lead was the American Smelting & Refining Co., operating jointly the Cerro Gordo and Estelle properties near Keeler. Shipments were made to the company's smelter at Selby throughout the year.

COLORADO

ELEVEN months actual mine production with an estimate by the mine operators and smelters for December indicates that the output of gold, silver, copper, lead, and zinc from Colorado ores and gravels in 1930 in terms of recovered and estimated recoverable metal was 218,471 ounces of gold, 4,290,587 ounces of silver, 44,646,000 pounds of lead, 9,787,000 pounds of copper, and 72,903,000 pounds of zinc, according to Chas. W. Henderson, of the Bureau of Mines. These figures are to be compared with 213,690 ounces of gold, 4,397,377 ounces of silver, 48,889,906 pounds of lead, 8,905,074 pounds of copper, and 58,861,000 pounds of zinc in 1929. Compared with 1929 figures, gold shows an increase of \$98,838, silver a decrease of 106,790 ounces, lead a decrease of 4,243,906 pounds, copper an increase of 881,926 pounds, and zinc an increase of 14,042,000 pounds. The gross estimated value of the output of metals in Colorado in 1930 is, gold \$4,516,196, silver \$1,651,876, lead \$2,321,592, copper \$1,213,588, zinc \$3,426,441, or a total of \$13,129,693, as compared with \$15,293,343 in 1929.

The Cripple Creek district in 1930 produced \$2,526,677 in gold, as compared with \$2,640,034 in 1929. The Golden Cycle 1,200-ton roast-amalgamation, cyanidation-flotation custom mill, at Colorado Springs, was operated at 900 to 1,000 tons daily, principally on Cripple Creek sulpho-telluride ores, but also on outside gold and silver ores and concentrates from Boulder, Clear Creek, Gilpin, Lake, Mineral, Ouray, and Park Counties. During 1930, the 300-ton selective flotation mill, added to the Golden Cycle equipment in November, 1929, was used in addition to treating the outside ores, to float part of the Cripple Creek telluride ores.

San Juan County in 1930 produced \$658,357 in gold, 1,085,611 ounces of silver, 17,632,000 pounds of lead, 2,668,000 pounds of copper, and 20,131,000 pounds of zinc as compared with \$431,404 in gold, 871,544 ounces of silver, 19,012,224 pounds of lead, 2,157,000 pounds of copper and 22,858,000 pounds of zinc in 1929. Early in 1930 the Sunnyside Mining & Milling Company pushed the daily tonnage of its selective flotation mill, at Eureka, up to 1,000 tons a day and kept the input at that figure until cessation of all milling operations in September, 1930. The new 300-ton Shenandoah selective flotation mill was placed in operation early in January and was kept in steady operation throughout the year on gold-copper-silver ore from the Mayflower claim. Owing to the closing of the Sunnyside mill, which supplied 80 percent of the charge on the Durango blast furnace, the Durango lead bullion-copper matte smelter was closed November 1.

Shipments of zinc-lead-silver-gold-iron sulphide ores from Rico, Dolores County, to Salt Lake Valley (Utah) flotation custom mills ceased April 30, 1930, with desultory shipments thereafter of lead-silver ore to Durango, and production for 1930 was 64,111 ounces of silver, 1,046,000 pounds of lead, 200,000 pounds of copper and 977,000 pounds of zinc.

Eagle County became one of the principal producing counties in 1930 through the production of the Empire Zinc Co.'s

Eagle Mine on Battle Mountain, near Red Cliff. Since 1912, this company has been opening and developing its holdings, with some regular annual production, but throughout 1930 it ran its 600-ton jig and flotation mill, completed and set in operation in November, 1929. This mill is built in an excavation cut into the granite face of Eagle Canyon and therefore is mostly underground.

Lake County (Leadville) in 1930 produced \$79,339 in gold, 616,783 ounces of silver, 12,718,000 pounds of lead, 254,000 pounds of copper and 23,112,000 pounds of zinc, as compared with \$138,031 in gold, 394,270 ounces of silver, 10,343,286 pounds of lead, 317,096 pounds of copper, and 26,828,000 pounds of zinc in 1929. The Leadville district also produced 20,000 long tons of iron-manganese ore. The Leadville Zinc-Lead 250-ton selective flotation mill was operated steadily, chiefly on zinc-lead-iron-silver sulphide ore from the Leadville Deep Mines Company, a holding, leasing, and operating company of properties on Carbonate Hill and Adelaide Park, including the properties of the Iron Silver Mining Co., the Western Mining Co., the Empire Zinc Co., and others.

The Climax Molybdenum Co., at Climax, 14 miles north of Leadville, continued its new Philipson Tunnel and milled at the rate of 1,100 tons a day, producing 3,100,000 pounds of contained elemental molybdenum in its molybdenite concentrate. This company also completed a new crushing plant, which has a capacity of 300 tons an hour.

The United States Vanadium Co.'s 140-ton roast, leaching, and precipitation mill, at Rifle, was operated continuously during 1930 on ore from its vanadium mine, 12 miles from Rifle.

From Gunnison County, small shipments of gold ores were made to the Golden Cycle Mill from Ohio City properties and of gold-silver ore from the Vulcan-Mammoth Chimney-Good Hope group, at Vulcan.

The Rawley Mine, at Bonanza, Saguache County, reopened in 1926 and continuously worked since that date, was closed in the latter part of June, 1930, and the machinery of the 400-ton flotation mill and all other equipment was sold for its salvage value.

Summit County's production in 1930 was confined to small shipments of lead-silver ore from Breckenridge and Montezuma and to placer gold-silver bullion from the Continental Dredging Co.'s dredge on Blue River, below Breckenridge, and small hydraulicking and sluicing operations on Blue and Swan Rivers.

Park County's gold production increased from \$206,797 in 1929 to \$494,305 in 1930, as the result of increased shipments of higher than the usual grade gold ore from the London mine. Shipments of gold ore were also made from the Orphan Boy and the Pacific properties.

Clear Creek County showed an increase in its gold production owing to the operations of the Little Mattie and Lincoln mines near Idaho Springs, and the Gold Dirt, at Empire, but a decrease for silver and lead, owing to the idleness of silver mines at Silver Plume. Gilpin County showed an increase in gold production from the operations of the Chain-O-Mines, at Central City.

IDAHO

VALUE of the gold, silver, copper, lead, and zinc produced from ore mined in Idaho in 1930, according to estimates by C. N. Gerry and T. H. Miller, of the Bureau of Mines, was about \$21,645,400, as compared with \$31,104,246 in 1929. Decreases were recorded in all metals except gold. The decreases, however, in silver, lead, and zinc were small when compared with those of other Western States. Increased smelting and refining operations were conducted at Kellogg, and the electrolytic zinc plant at Silver King was run on a part-time basis.

According to published reports, mining companies paid dividends amounting to approximately \$4,212,350, compared with \$5,000,000 paid in 1929.

The mine output of gold in 1930 was valued at \$436,100, as compared with \$418,545 in 1929. The increase in the output of gold was due chiefly to the regular production of gold bullion from the Sherman Howe mine at Burgdori, Idaho County. The Gold Hill & Iowa mine at Quartzburg, worked the entire year by the Talache Mines (Inc.), took first place in gold production in Idaho and produced more than one-fourth of the total gold of the state. The Idawa property ranked second as a producer of gold in Idaho in 1930, but its output was much less than that in 1929.

The output of silver decreased slightly from 9,414,403 ounces in 1929, to about 9,260,260 ounces in 1930, and the value decreased from \$5,017,877 to about \$3,565,200 on account of a decided decrease in the average price of silver. In spite of this decrease the state became the second largest producer of silver in the United States, following Utah. In the Coeur d'Alene district, which produced at least 8,850,000 ounces of silver, about 75 percent of the product was recovered from the ores of the four largest producers: The Sunshine, Bunker Hill & Sullivan, Hecla, and Morning mines, which ranked in the order given. The Page, Crescent, Dayrock, Hall-Interstate, Sherman, Triumph, and Gold Hunter mines were also large producers, and the Blackhawk, Whitedelf, Constitution, Golconda, Tamarack & Custer, Star, Galena, and Sidney properties followed in order. The Sunshine property east of Kellogg increased its silver output nearly 35 percent over the record established in 1929. The enlarged flotation plant was worked regularly and copper-lead concentrate rich in silver was shipped to the smelter at Bradley. A large increase in the output of silver was reported from the Hall-Interstate property of the Bunker Hill & Sullivan Mining & Concentrating Co., near Cascade, Valley County. The new 120-ton flotation mill at the property was operated regularly and the mine became an important producer of silver, lead, and zinc. Due chiefly to the opening of ore of higher grade the Federal Mining & Smelting Co. reported large increases in the silver output of the Page and Blackhawk properties.

The output of copper decreased from 5,131,438 pounds in 1929, to about 2,574,600 pounds in 1930, and the value decreased from \$903,133 to about \$319,200 as the average price of the metal decreased 5.2 cents a pound. The Mackay

Metals, Inc., was the largest producer of copper in Idaho in 1930, but the output was less than half that of 1929. The company operated its 250-ton concentration plant and made regular shipments of ore and concentrates to a copper smelter near Salt Lake City, Utah, until August when the mine and mill were closed due to the prevailing price of copper. Other producers of copper in the order of their output were the Sunshine, Hecla, Winder-Stillman Consolidated (Pope-Shenon mine), Morning, Bunker Hill & Sullivan, Hall-Interstate, and Crescent properties.

The output of lead decreased from 297,389,488 pounds in 1929, to about 266,286,540 pounds in 1930, and the value from \$18,735,538 to about \$13,846,900. The Bunker Hill & Sullivan, Morning, and Hecla mines were as usual the three largest producers. They were followed in order of output by the Page, Sherman, Dayrock, Gold Hunter, Jack Waite, Blackhawk, Triumph, Star, Frisco, Sidney, Tamarack & Custer, Golconda, Whitedelf, Wilbert, Constitution, Hall-Interstate, Sunshine, and Galena properties. Considerable lead was also recovered from the Bunker Hill tailings dump near Kellogg. Increases in lead production were reported by the Bunker Hill & Sullivan, Blackhawk, Hall-Interstate, Constitution, Frisco, Whitedelf, and Triumph mines, but unusually large decreases were reported by the Tamarack & Custer, Star, Golconda, Morning, Livingston, Gold Hunter, Sherman, Wilbert, Sidney, Hecla, Dayrock, Page, Galena, and Sunshine properties.

The zinc recovered from ore and concentrates decreased from 91,350,807 pounds in 1929, to about 74,000,000 pounds in 1930, and the value from \$6,029,153 to \$3,478,000. About 75 percent of the zinc output was recovered by roasting and leaching at the electrolytic plants at Great Falls and Anaconda, Mont., and most of the remainder was recovered at the new plant of the Sullivan Mining Co., at Silver King. The Morning mine exceeded all others in zinc production and produced about 50 percent of the total zinc of the state. Next in order were the Triumph, Sidney, Bunker Hill & Sullivan, Star, Constitution, Frisco, Hall-Interstate, Tamarack & Custer, Page, Hecla, and Golconda mines. Large decreases in zinc output were recorded from the Star, Tamarack & Custer, Golconda, Sidney, Frisco, Humming Bird, Jack Waite, and Page properties. Increased zinc production was recorded from the Hall-Interstate, Constitution, Bunker Hill & Sullivan, Triumph, and Morning mines. The output of zinc from the Star mine of the Sullivan Mining Co., at Burke, was about one-third that of 1929. The mine near Burke and the mill at Kellogg were closed in May due to the low price of zinc. Operations at the new zinc plant at Silver King were continuous during the year, but at a greatly reduced rate. A large quantity of lead concentrates and zinc concentrates were shipped to Montana from the Hercules custom flotation plant at Wallace. The plant treated lead and lead-zinc ore from several mines in the Coeur d'Alene region, chiefly from the Sherman, Dayrock, and Tamarack & Custer mines.

The tonnage treated in 1930, however, was considerably less than that in 1929.

MONTANA

THE value of gold, silver, copper, lead, and zinc produced from Montana mines in 1930, according to estimates made by C. N. Gerry and T. H. Miller, of the Bureau of Mines, was about \$32,943,350, a decrease of more than 54 percent from the record value of \$71,779,547 in 1929. The curtailment of the copper production in Montana was particularly notable and resulted in a decrease of nearly 100,000,000 pounds from the record output in 1929.

The value of the gold output decreased from \$1,131,949 in 1929, to about \$870,300 in 1930. The largest gold producers in the state were the Spring Hill, Anaconda, Liberty Montana, Comet, Block P, Butte & Superior, and St. Louis properties. A large decrease of nearly 50 percent in the gold output of the Butte district resulted from curtailment in the production of copper ore. The large decrease in gold, however, was partly offset by large increases from other properties, and particularly from the Spring Hill mine of the Montana Mines Corporation operating South of Helena. The Spring Hill mine became the largest producer of gold in Montana in 1930, and surpassed the Anaconda Copper Mining Co., which held first place in 1929. The capacity of the Spring Hill mill, which was converted from cyanidation to flotation in 1929, was increased to 400 tons a day during 1930 by the addition of a third ball mill.

The output of silver decreased from 12,716,977 ounces in 1929, to about 7,760,000 ounces in 1930, a decrease of nearly 5,000,000 ounces; it was the lowest output since 1921. The decrease in the silver output combined with the decline in the average price of silver resulted in a decrease in the value of the output from \$6,778,149 in 1929, to about \$2,987,600 in 1930. Most of the silver produced in Montana is recovered from copper ore and the output varies directly with the copper output. Due to the curtailment in the production of copper ore there was a large decrease in the output of silver from the mines at Butte, and particularly from the group operated by the Anaconda Copper Mining Co., which reported a decrease of about 38 percent. The North Butte Mining Co. was the only large producer in the Butte district that reported an increased silver output. The largest producers of silver in Montana in 1930, named in order of their output, were the mines operated by the Anaconda Copper Mining Co., followed by the Flathead, Block P, Emma, Trout, East Butte, Butte & Superior, North Butte, Poser, and Granite Bimetallic properties.

The copper output decreased from 297,725,972 pounds in 1929, to about 198,200,000 pounds in 1930, and the value from \$52,399,771 to about \$24,576,800, the lowest output and value since 1922. The decrease of nearly 100,000,000 pounds of copper, combined with the decline in price, resulted in a decrease of more than 53 percent in the value of the output. Despite the marked decline in the output of copper the state regained its position as the second largest producer of copper in the United States.

The Anaconda Copper Mining Co., as in the past, produced most of the state's copper from its mines at Butte, but decreases from the property operated by this company accounted for nearly all the decrease in the state output. The North Butte Copper Co., also operating property at Butte, reported a substantial increase and ranked second in copper output. It was followed by the East Butte and Butte & Superior mines. Other large copper producers were the Emma, Poser, Block P, and Liberty Montana mines. The Silver Dyke mine, near Neihart, formerly a large producer of copper and lead, was closed early in 1929.

The production of lead decreased from 39,213,707 pounds valued at \$2,470,464 in 1929, to about 23,300,000 pounds valued at \$1,211,600 in 1930, the lowest output and value since 1921. The decrease of about 40 percent in the production of lead was due to curtailment at all the leading producers of lead in the state. Operations at the Block P mine, owned by the St. Joseph Lead Co., were continuous from January to September, after which the company's 400-ton flotation plant was closed. The property again ranked first in the output of lead in Montana, but the closing of the mine decreased the lead output of the state about 25 percent. The Emma mine of the Butte Copper & Zinc Co. again held second place as a producer of lead, although a decrease of over 40 percent was reported in its output. The Jack Waite Mining Co., operating property on the divide between Shoshone County, Idaho, and Sanders County, Mont., mined considerable lead ore from the eastern section of the property in Montana. The property ranked third as a producer of lead in Montana in 1930. Other large producers, named in the order of their output, were the Butte & Superior and Poser mines, the East Helena slag fuming plant, and the Anaconda, Comet, Trout, Joe Dandy, and Commonwealth properties. The lead smelter at East Helena was regularly operated.

The output of zinc recovered from ore mined in Montana decreased from 136,351,734 pounds in 1929, to about 70,150,000 pounds in 1930, and the value from \$8,999,214 to about \$3,297,050, the lowest output and value since 1921 and a decrease of more than 63 percent from the value of the output in 1929. The electrolytic zinc plants near Great Falls and Anaconda were operated continuously, treating concentrate from Anaconda and Butte and considerable custom material, chiefly from Utah, Idaho, and Montana. Nearly 64 percent of the total output of zinc from Montana mines was produced from three properties at Butte, and most of the remainder came from the East Helena fuming plant and the Block P mine. The Butte & Superior mine was the largest producer of zinc in Montana in 1930, but the gradual depletion of the commercial ore and the closing of the mine in August resulted in an output nearly 65 percent less than that of 1929. The group of zinc mines owned by the Anaconda Copper Mining Co., including the Elm Orlu, Poser, Moulton, Curry, and Magnolia mines, took second place in zinc output and the production was distinctly less than the output of the group in 1929. The East Helena Slag fuming plant of the Anaconda Copper Mining Co., which treats current slag from the

lead smelter, was third in zinc output in Montana, followed by the Emma property at Butte and the Block P property of the St. Joseph Lead Co., near Hughesville. Shipments of concentrates from the Block P mine ceased in September and the company reported a decrease of about 18 percent in zinc output compared with the output of 1929. The North Butte Mining Co., a large producer of zinc in 1929, mined no zinc ore in 1930. Considerable lead-zinc ore was milled from mines in other districts in Montana, and especially from the Trout and Silver Prince mines in Granite County and the Comet mine near Basin, in Jefferson County. The custom flotation plant for lead-zinc ore was active at Anaconda, and the Anaconda Copper Mining Co. also operated the Timber Butte custom mill south of Butte.

NEVADA

VALUE of gold, silver, copper, lead, and zinc in Nevada decreased from \$33,030,237 in 1929 to about \$17,531,800 in 1930, according to a preliminary statement prepared by Victor C. Heikes, of the Bureau of Mines. Compared with 1929 production there were decreases in the output of all metals except lead and zinc.

The gold output in Nevada decreased from \$3,384,211 in 1929 to about \$2,729,000 in 1930. The Nevada Consolidated Copper Co. and the Elko Mines Co. each produced about the same quantity of gold and were the largest producers in 1930. The Tonopah Extension at Tonopah nearly doubled its former annual output of gold and ranked with the Consolidated Copper Mines at Ely and the Seven Troughs mine with its new cyanide mill in operation near Lovelock, followed by the Bradshaw (Inc.), which worked the Goldfield tailings. These four producers recovered from ore and tailing over a million dollars in gold. The White Caps mine at Manhattan shipped gold ore for smelting to a Utah plant and although the property was closed October 1 it was about the seventh largest gold producer in 1930. Compared with the White Caps output the Tonopah Belmont and Tonopah Mining Co. each produced an equal quantity of gold from ore treated in a cyanidation plant near Tonopah. The cyanide mill of the Gold Hill Development Co., 4 miles north of Round Mountain, was started in August; its initial bullion output in October was valued at \$25,000 in gold and silver, and the Nevada Porphyry Gold Mines operated its amalgamation mill at Round Mountain and hydraulic operations were continued when a full supply of water was available. The Flowery Mines, 4 miles east of Virginia City, prepared its cyanide mill to treat custom ore, and the Kernick Divide Mining Co. at Sodaville, in Mineral County, nearly completed a mill for treatment of ore by amalgamation and flotation.

The old dumps of the Mary mine at Silverpeak are to be worked over by cyanidation and adds another mill to the district. Improvement in the saving of metal at the Black Mammoth and R. & K. mills, each at Silverpeak, equipped with flotation machines, increased production of concentrate. Active work was started in the treatment of the old Delamar tailings, 16 miles from Caliente, in

Lincoln County, and the Basque Mining & Milling Co., after experimenting with a pilot plant, put in the foundation for a 100-ton mill 17 miles north of Winnemucca, in Humboldt County.

The silver production decreased from 4,923,526 ounces in 1929 to about 4,174,000 ounces in 1930 and the value from \$2,624,239 to about \$1,607,000. The Tonopah district produced about 1,903,000 ounces of silver, a decrease, compared with the output of 1,965,695 ounces in 1929. The Tonopah Extension Mines (Inc.) was the largest silver producer in the state and doubled its output of 1929 and was followed by the Treadwell Yukon (Tybo branch), in Nye County, and Combined Metals lease in Lincoln County. Next in rank were the Bristol Silver, Tonopah Belmont, Tonopah Mining, and Elko Mines. Other important silver producers were the Piermont Mines Co. in White Pine County, Nevada Consolidated Copper Mines, and lessees of the Richmond-Eureka in Eureka County. Large decreases in the production of silver were indicated in the reports of the Consolidated Cortez, which closed in January, and at the same time the Betty O'Neal made its last shipment of concentrate. The product of the West End Consolidated at Tonopah dwindled down to almost nothing and the Tonopah Belmont in the hands of lessees produced but half of its former silver output, the Tonopah Mining Co. following with only a third of its output compared with the previous year.

The copper output decreased from 140,138,809 pounds in 1929 to about 85,189,000 pounds in 1930 and in value from \$24,664,430 to about \$10,563,400. The Nevada Consolidated Copper Co., operating its mine, mill, and smelter at Ely and McGill, was the largest producer of copper in the state with about three-fourths of its former output. In keeping with the general policy to curtail production the Consolidated Copper Mines Corporation at Kimberly, which was second in output, also produced less copper, followed by the Bristol Silver near Pioche and the Copper Canyon mines near Battle Mountain.

Copper ore was produced at Contact until August, but only about 1,400 tons of ore was shipped, compared with 5,786 tons in 1929. In the Yerington district mining was at a standstill with only 500 tons of copper ore shipped, compared with the output of 170,000 tons the previous year.

The lead output increased from 19,692,568 pounds in 1929 to about 23,507,000 in 1930, but the value decreased from \$1,240,632 to about \$1,222,400. The Combined Metals lease at Pioche was the leading producer of lead, followed by the Treadwell Yukon (Tybo property) in Nye County, and the Bristol Silver in Lincoln County. Other large producers were the Panther, near Montello, the Yellow Pine mine at Goodsprings, the Richmond-Eureka mine at Eureka, and the Nevada Lead & Zinc in the Spruce Mountain district, Elko County.

The zinc recovered from ore mined in Nevada increased from 16,920,083 pounds to about 30,000,000 pounds and from \$1,116,725 in value to about \$1,410,000. This large output of zinc was surpassed only once before, in 1916. In 1930 the Combined Metals was the largest producer of zinc, followed by the Tybo property of the Treadwell Yukon Co. in

Nye County and the Yellow Pine mine in Goodsprings, Clark County.

NEW MEXICO

ELEVEN months actual mine production with an estimate by the mine operators for December indicates that the output of gold, silver, copper, lead, and zinc from New Mexico ores and gravels in 1930 in terms of recovered and estimated recoverable metal was 31,556 ounces of gold, 1,091,000 ounces of silver, 20,867,000 pounds of lead, 67,790,000 pounds of copper, and 68,277,000 pounds of zinc, according to Chas. W. Henderson, Bureau of Mines. These figures are to be compared with a production in 1929 of 35,176.5 ounces of gold, 1,121,546 ounces of silver, 22,260,811 pounds of lead, 97,717,262 pounds of copper, and 68,910,000 pounds of zinc, and show decreases of 3,620.5 ounces (\$74,842) in gold, 30,546 ounces of silver, 1,393,811 pounds of lead, 29,927,262 pounds of copper, and 633,000 pounds of zinc. The gross value of the New Mexico metal production at average yearly prices in 1930 was gold, \$652,320; silver, \$420,035; lead, \$1,085,084; copper, \$8,405,960; and zinc, \$3,209,019, with a total of \$13,772,418, as compared with \$24,473,675 in 1929, a decrease for 1930 of \$10,701,257, or 44 percent.

In quantity, zinc surpassed the output of copper, but in value copper continued to be the most important metal produced in New Mexico. The large low-grade porphyry copper deposit of the Chino Mines of the Nevada Consolidated Copper Co., at Santa Rita, was mined at approximately 6,500 tons daily, as compared with 10,886 tons in 1929. The deposit is mined by open pit methods, using steam and electric shovels, and the ore is concentrated at the company's flotation mill, at Hurley, which has a full capacity in its seven units of 12,000 tons a day. The Lordsburg district, the second largest copper producer in the state, shipped in 1930 approximately 109,000 tons of siliceous copper-gold-silver ores as compared with the 1929 output of 83,091 tons, which contained 10,611 ounces of gold, 165,716 ounces of silver, 105,666 pounds of lead, 4,861,896 pounds of copper. This ore was shipped in 1930 chiefly to Douglas, Ariz., but also to El Paso, Tex. The largest producing mine in this district is the Eighty-Five. Other producers in 1930 were the Anita, Bonney, Misers Chest, Robert E. Lee, and Waldo. The Hanover-Bessemer Iron & Copper Co., at Fierro, shipped several thousand tons of copper ore to the El Paso copper smelter and several hundred thousand tons of iron ore to the steel plant at Pueblo, Colo.

The Pecos mine, of the American Metal Co., on Willow Creek, San Miguel County, in its fourth year of production, continued to produce at about 300 tons a day, or one-half capacity for the first half of 1930 but stepped up the output to 450 tons during the last half of the year. In 1930, the main shaft was sunk to the 1,000-foot level. The mine and mill are connected by a 12-mile aerial tramway. The capacity of the mill, a selective flotation plant, is 600 tons a day. The mill in 1930 produced 36,462 tons of zinc concentrates and 16,046 tons of lead concentrates, as compared with 52,754 tons and 17,076 tons, respectively, in 1929. This mine is the largest single producer of gold, of silver, of lead, and of zinc in New Mexico. Other large pro-

ducers of zinc concentrates were the Empire Zinc Co.'s flotation mill, at Hanover, the Black Hawk selective flotation mill, at Hanover, and the Peru selective flotation mill, at Wemple, near Deming. Zinc ores and concentrates produced in New Mexico in 1930 amounted to 77,468 tons containing 83,197,993 pounds of zinc, averaging 53.7 percent zinc.

The Pecos, Black Hawk, Peru, and Royal John mills also produced lead concentrates. The Pecos and Combination lead concentrates contained much lead and silver (as well as copper) and the content of gold in the Pecos lead concentrates made that mine the largest gold mine in the state. Other producing lead districts were the Organ Mountains district, Dona Ana County; the Hanover district, Grant County; and the Magdalena district, Socorro County.

The second largest gold producing district was the Lordsburg district; and the copper concentrates from the Chino mines contained considerable gold in the aggregate, although the content per ton was low.

OREGON

THE total value of the gold, silver, copper, lead, and zinc produced from lode and placer mines in Oregon in 1930 is estimated at \$309,100, or a decrease of \$176,300, compared with 1929, according to figures prepared by Victor C. Heikes, of the Bureau of Mines. There were decreases in the output of all metals, with copper recording the largest loss. Western Oregon led in the value of the output of metals, but with the output of a new dredge in eastern Oregon the eastern and western portions of the state were about equally divided as to the gold yield.

The value of the gold yield in Oregon in 1930 is estimated at \$285,300, a decrease of about \$68,000, compared with 1929. The larger part of the output came from placer mines, chiefly from dredging operations, but water shortage the last two seasons reduced the gold yield. Two dredges were in operation in eastern Oregon, the Empire and Granite Creek, but the old Superior dredge was not working. The Buffalo lode mine, the leading producer in eastern Oregon, was closed down in midsummer, but work was again started in November on the Monitor vein, reported to be the largest of the Buffalo veins. In western Oregon the Robertson mine equaled its production of the preceding year and negotiations were reported whereby the mine could be put on a 100-ton daily production in 1931. The Llano De Oro was the largest producer of gold from hydraulic mining.

The output of silver from lode and placer mines in Oregon in 1930 is estimated at 8,500 fine ounces, valued at \$3,200, a decrease of about 21,500 ounces in quantity and of about \$12,800 in value, compared with 1929. The largest producer of silver was the Buffalo mine.

The output of copper from mines in Oregon in 1930 is estimated at 161,900 pounds, valued at \$20,100, which is a decrease of about 493,800 pounds in quantity and of about \$95,300 in value, compared with 1929. The largest producer of copper ore was the Queen of Bronze and Cowboy property in Josephine County, which ceased production in April.

The output of lead in Oregon in 1930 is estimated at 9,500 pounds, valued at

\$500, a decrease of 10,680 pounds in quantity and of about \$800 in value, compared with 1929. Concentrates shipped from the Buffalo mine in Grant County were the chief source of lead in the state. A car lot of sulphide ore containing silver, copper, lead, and zinc was produced in the North Santiam district of Marion County from a mine under development. This development was important, considering the fact that zinc was for the first time in the history of Oregon credited as marketed metal from ore shipped to Utah.

SOUTH DAKOTA

METAL mines in South Dakota in 1930 produced \$8,423,776 in gold and 105,000 ounces of silver, according to Chas. W. Henderson, Bureau of Mines. This compares with the production in 1929 of \$6,549,599 in gold and 85,182 ounces of silver. Despite the serious damage by fire to the Ellison hoist on July 10, 1930, the Homestake mine, at Lead, the largest producing gold mine in the United States, increased its production 1,900,000 over the 1929 output. The Keystone Consolidated Mines, Inc., near Keystone, operated its cyanide mill part of the year. The Bald Mountain Mining Co. completed in July its 1,800-foot incline adit and cut the faulted block of ore in the Two Johns, determined by diamond drilling. Blocking out of ore was continued throughout the remainder of the year.

TEXAS

ELEVEN months actual production with estimates for December from mine operators and smelters indicate that the production of mines in Texas for 1930 was 176 ounces of gold, 389,000 ounces of silver, 400,000 pounds of lead, and 120,000 pounds of copper, according to Chas. W. Henderson, of the Bureau of Mines. These figures are to be compared with 1,279 ounces of gold, 1,020,516 ounces of silver, 849,683 pounds of lead, and 341,000 pounds of copper in 1929.

The Presidio mine, at Shafter, Presidio County, operated almost continuously since 1882, and by the American Metal Co. since 1926, closed its 175-ton cyanidation-concentration plant in June, 1930, because of the low price of silver. The World Exploration Co. completed its flotation mill at the Hazel mine, near Van Horn, Culberson County, but that mill was also closed down after a short run had produced silver-copper concentrates. Small shipments of copper-silver smelting ore were made from Allamore, Hudspeth County.

UTAH

MINES of Utah in 1930 produced gold, silver, copper, lead, and zinc valued at about \$46,777,600, a decrease of more than \$49,000,000 from the record output of 1929, according to estimates of C. N. Gerry and T. H. Miller, of the Bureau of Mines. Large decreases were recorded in the output of all metals, and particularly in copper and lead. The output had a value lower than any since 1922. The smelting plants at Murray, Midvale, Garfield, and International were regularly operated, but the output of blister copper and lead bullion was much less than that in previous years.

Utah remained first in the United States in the production of silver, but it ranked third in copper after Arizona and Montana, and third in lead after Missouri and Idaho. The custom flotation mills at International, Midvale, and Bauer were operated the entire year, and ore receipts at Bauer, chiefly from Nevada and Utah, were distinctly increased.

The dividends reported paid by mining companies in Utah in 1930 amounted to about \$18,630,000, exclusive of \$2,558,102 paid by one company which controls mines at Eureka and Bingham, as well as mines in other states. The companies that contributed to the former total were the Utah Copper, Tintic Standard, Silver King Coalition, North Lily, Eureka Standard, and Silver Wave. The dividend total compares with \$38,167,339 paid in 1929, and \$18,307,894 paid in 1928.

Gold production decreased considerably from \$4,969,915 in 1929, to about \$4,121,900 in 1930. As in recent years, virtually all the gold was recovered from ores and concentrates smelted. The output of gold from mines in the Bingham district showed a decrease of more than 63,000,000 ounces compared with that of 1929, due chiefly to lessened production from the property of Utah Copper Co., at Bingham. Gold production from the Tintic district was decidedly greater than in 1929 as a result of increased shipments of siliceous gold ore from Eureka Standard, Eureka Lilly, and North Lily mines, but gold from the Park City region decreased considerably. The largest producers of gold were the Utah Copper, Eureka Standard, North Lily, United States Smelting (including Bingham Mines Co.), Eureka Lilly, Park Utah Consolidated, Chief Consolidated, Niagara, Bluestone Lime & Quartzite, Utah-Apex, and Tintic Standard properties. The unusually large decrease in gold production from the Utah Copper property more than offset gains from other mines and resulted in a decrease of more than 40,000 ounces for the state.

The silver output decreased from 17,592,396 ounces in 1929, to about 12,940,260 ounces in 1930, and the production was about 3,000,000 ounces more than that of Idaho, which was second in silver production in the United States. For 10 years Utah has been the leading silver producer of the United States. The value of the silver output decreased from \$9,376,747 to about \$4,982,000. The decrease of about 4,600,000 ounces was about equally divided between the Bingham, Tintic, and Park City regions. The Tintic Standard Mining Co. was the largest producer of silver. It was followed closely by the Silver King Coalition Mines Co. and the United States Smelting, Refining & Mining Co. Next in order came the Park Utah Consolidated, Utah Copper, Plutus, Chief Consolidated, North Lily, Park City Consolidated, and Bingham Prospect properties. The greatly increased output from the Park City Consolidated property, east of Park City, was especially noteworthy, although the company was developing a silver mine on a declining silver market.

Copper decreased from 318,282,523 pounds in 1929, to about 178,278,226 pounds in 1930, the smallest output since 1922. The value decreased from \$56,017,724 to about \$22,106,500. Utah has ranked second in copper production after Arizona since 1925, but in 1930 the state

took third place after Arizona and Montana. Drastic curtailment of production by the Utah Copper Co., at Bingham, resulted in a decrease of nearly 50 percent from the record output of 1929. The company operated continuously during the year, but the mine and mills were worked at about one-half their rated capacity. The large concentrator at Arthur was idle most of the year and the entire ore output was treated in the Magna mill. There were slight decreases in the output of copper from the Tintic district and the Park City region, but the large decrease from the Bingham district accounted for nearly all the state decrease. With the exception of the United States Smelting, Refining & Mining Co., all the large producers of copper, and particularly the Utah Copper, Utah-Delaware, Utah-Apex, and Silver King Coalition properties, reported substantial decreases. Following the Utah Copper Co., the leading copper producers were the United States Smelting, Utah-Apex, Ohio Copper, Utah-Delaware, and Silver King Coalition companies.

The lead output decreased from 298,754,429 pounds in 1929, to about 221,973,077 pounds in 1930, and the value decreased from \$18,821,529 to about \$11,542,600. The lead production was the smallest since 1923, and it was considerably less than the lead output from mines in Idaho in 1930. A decreased lead output was reported by 37 mines, while only 12 properties reported increases; the general decrease was more than 76,000,000 pounds. A substantial increase in lead was reported from the properties of the United States Smelting, Refining & Mining Co., at Bingham, and smaller increases were made at the Tintic Lead (Horn Silver), Bluestone Lime & Quartzite, Eureka Lilly, Park Galena, and Park City Consolidated properties. Unusually large decreases were made at the North Lily, Utah-Delaware, Park Utah Consolidated, Tintic Standard, Utah Copper, New Quincy, Silver King Coalition, Utah-Apex, Bullion Coalition (Combined Metals Reduction Co.), Bingham Prospect, Chief Consolidated, and Victoria properties. Each of these properties reported decreases of more than 2,000,000 pounds of lead. A decrease of more than 31,000,000 pounds was shown from the Tintic district, more than 25,000,000 pounds from the Park City region, and more than 18,000,000 pounds from the Bingham district. The largest producers of lead in order of output were the United States Smelting (including Bingham Mines Co.), Silver King Coalition, Tintic Standard, Park Utah Consolidated, Bluestone Lime & Quartzite, North Lily, Utah-Apex, Eureka Lilly, Bullion Coalition, Chief Consolidated, Tintic Lead (Horn Silver), Utah Copper, Plutus, Utah Metal & Tunnel, and Bingham Prospect properties.

The zinc, recovered chiefly from concentrates leached or smelted, decreased from 103,019,485 pounds in 1929, to about 85,629,788 pounds in 1930. Value of the output decreased from \$6,799,286 to about \$4,024,600. All the large flotation mills in Utah treating lead-zinc ore—International, United States, Combined Metals, Silver King Coalition, and Utah Apex—were operated in 1930, but the Silver King plant was not operated full time and the Utah-Apex was closed in October. The output of zinc from the Bingham district was about 1,000,000 pounds less than that in 1929, but there

was no important change in the zinc output of the Tintic district. The decrease, therefore, was chiefly from the Park City region. Large decreases in the production of zinc from the Bingham district were reported by the Utah-Apex, Utah-Delaware, Utah Metal & Tunnel, Utah Copper, and Bingham Prospect properties, but these losses were almost completely offset by a substantial increase in zinc production from the properties of the United States Smelting, Refining & Mining Co. In the Park City region, a decreased zinc output was reported by the Park Utah Consolidated and the New Quincy companies and slight increases were reported by the Park City Consolidated, Silver King Coalition, and Park Galena companies. The Horn Silver mine of the Tintic Lead Co., in Beaver County, reported a large increase in zinc recovered from ore shipped to custom mills, but the output of zinc from the Bullion Coalition mine near Stockton, in Tooele County, was decidedly less. The largest zinc producers in Utah in 1930 were the United States Smelting, Park-Utah Consolidated, Silver King Coalition, Tintic Lead (Horn Silver), Utah-Apex, Bingham Prospect, Chief Consolidated, Bullion Coalition, Niagara, Park City Consolidated, and Park Galena mines.

In 1930 the mines of Utah produced about 11,131,440 tons of ore and old tailings, a decrease from 19,831,975 tons in 1929. Of this total the Bingham district produced about 10,110,771 tons as compared with 18,515,213 tons in 1929. The mines of the Tintic district produced about 373,040 tons of ore and old tailings, as compared with 455,316 tons in 1929. Crude ore and old tailings produced by mines in the Park City region amounted to about 575,000 tons in 1930, as compared with 777,909 tons in 1929.

WASHINGTON

VALUE of the gold, silver, copper, lead, and zinc produced from ore mined in the State of Washington in 1930 was about \$349,200 as compared with \$552,233 in 1929, according to estimates made by C. N. Gerry, of the Bureau of Mines. There were increases in the quantities of recovered gold and lead, but decreases were reported in the output of silver, copper, and zinc. A general decrease was recorded in the value of all metals but gold.

The production of gold increased from \$76,898 in 1929, to about \$79,000 in 1930. Nearly all the mines in the Republic district were idle as they were in 1929. The Boundary Red Mountain Mining Co., south of Sardis, British Columbia, was the largest producer of gold in Washington and the company reported an output which was about three-fourths of the gold production of the state, a marked increase over the 1929 output.

The output of silver decreased from 47,182 ounces in 1929 to 45,975 ounces in 1930 and the value decreased from \$25,148 to about \$17,700. The Chewelah Union mine, near Chewelah, was first in silver output, followed by the Sunset Conner Co., and the Pend Oreille.

The output of copper decreased slightly from 1,400,489 pounds in 1929 to about 1,300,000 pounds in 1930 and the value decreased from \$246,486 to about \$161,200. The Sunset Copper Co., near Index, the largest producer of copper in the state, operated its concentration mill from January to August, but the output was slightly less than in 1929.

The output of lead increased from 1,015,190 pounds, valued at \$63,956, in 1929, to about 1,113,460 pounds, valued view mine, in the Metaline district, Pend at about \$57,900, in 1930. The Grandview mine in the Metaline district, Pend Oreille County, the largest producer of both lead and zinc in Washington in 1929, was idle in 1930. The largest producer of lead in Washington in 1930 was the Electric Point mine, near Northport. Other producers of lead were the Pend Oreille Mines & Metals, at Metaline Falls, the Bonanza mine at Bossburg, Stevens County, and the Gladstone mine, near Northport, Stevens County.

The production of zinc decreased from 2,117,344 pounds in 1929 to about 710,640 pounds in 1930, due chiefly to the inactivity of the Grandview property near Metaline Falls. Most of the zinc came from the property of the Pend Oreille Mines & Metals, near Metaline Falls. The value of the zinc output decreased from \$139,745 in 1929 to an estimated value of \$33,400 in 1930.

WYOMING

The estimated output of gold, silver, and copper from Wyoming mines in 1930 in terms of recovered and recoverable metal was 465 ounces of gold, 125 ounces of silver, and 11,000 pounds of copper, according to Charles W. Henderson, of the Bureau of Mines. These figures are to be compared with 48 ounces of gold, 26 ounces of silver, and 4,301 pounds of copper in 1929. The increase for gold and silver is due chiefly to the operation of amalgamation-concentration mills at Atlantic City, Fremont County. Producing mines were the Carissa, Duncan, Crisman, Ellen Mc, and Sullivan (or "1914"). The copper in 1930 is from concentrates from one of these mills, supplemented by a car of copper ore from the Big Creek Copper Co., at Encampment. Small lots of gold bullion and gold concentrate were shipped from the 25-ton mill of the Gold Nugget property in the Copper Mountain district.

HARMONY MINES

(From page 101)

cleaner cell. Coarse underflow from the rougher cell goes to pump sump and thence returned to ball mill circuit. Overflow from rougher cell to tailing. Tailing from cleaner cell goes to pump sump and thence returned to circuit. Concentrate from cleaner to concentrate pump sump, thence through a 1-in. Wilfley sand pump to a 9-ft. Allen slime cone. Thickened concentrate to a 4-ft. by 8-ft. Oliver continuous filter. Overflow from slime cone to ball mill circuit. Filtered concentrate to 12-in. conveyor belt to two 60-ton storage bins. Tailing from the two rougher cells to 3-in. Krough sand pump, thence to two 4-ft. Allen sand cones. Overflow from sand cones to a 9-ft. Allen slime cone. Thickened discharge from sand and slime cones to an 8-ft. by 8-ft. Portland filter, filtered tailing to 20-in. conveyor belt to tailing dump. Water overflow from slime cone is either discharged to waste or reused as mill supply. The tailing is filtered for two reasons: to

eliminate any possibility of slime being carried down the creek bed to the ranches below and as an additional source of mill water supply during certain seasons of the year. A 10-in. by 14-in. Blaisdell Vacuum pump furnishes the vacuum for both filters. Concentrate is loaded from chutes into truck and thence by road 8 miles to the loading platform at Baker.

In addition to the concentrator the lower or mill camp is equipped with the following: Mine office, containing engineering and drafting rooms; quarters for superintendent and assistant; main office room. Assay laboratory, completely equipped for analysis and testing. Warehouse, shelved and pigeonholed for general repairs and supplies of all kinds. Transformer house, containing six 50-K. v. a. 1,900 to 2,200 transformers; supplying 2,200-volt current to mill and lower camp. Boarding house, bunkhouses, and garage.

POWER PLANT AND POWER LINES. The company operates its own power plant which was erected at Baker, Idaho, in 1928. The general equipment consists of a Chicago Pneumatic 450-hp. Bentz, 6-cyl., 4-cycle, full Diesel type engine. This engine is direct connected to a 375-K. v. a. generator. Current is generated at 2,200 volts and transformed upwards through three General Electric 150-K. v. a. outside transformers to 19,000 volts. Generator exciter is direct connected with generator and engine. Automatic alarm signals are supplied for fuel supply, lubricating oil, cooling water temperature and height of cooling water supply in water tank. A 5-hp. Fairbanks Morse gasoline engine operates a starting compressor supplying air to two receiver tanks at 400 lbs. pressure. Cooling water is supplied from a well near the plant; cooling water being delivered to the supply tank by an electrically driven, vertical deep well pump. Lights and small motors are supplied from three 2,200-volt, 220-120 transformers. Fuel oil is pumped from railroad tank cars to a 15,000-gallon storage tank, built by the Lang Welding Co., of Salt Lake City.

Current is carried over 8 miles of transmission line at 19,000 volts from the plant to the mine and mill camps. The line is constructed of wood poles, 30 to the mile, the wire of No. 6 bare copper. The current is transformed at mine and mill to 2,200 volts for use.

The power plant is operated by two men on 12-hour shifts. The mill crew consists of two men per 8-hour shift, except on the day shift when two extra men are employed on the tramway and crushing section. The mine supplies approximately 4½ to 5 tons per man employed per shift. When in full operation the company employs between 45 and 50 men.

NEWS OF THE MINING FIELD



Congress Committee Urges Immediate Consideration of Russian Manganese Import Ban

Immediate consideration by Congress of an embargo against manganese imports from Russia is recommended by the special House Committee headed by Representative Fish, of New York, in its report on its investigation of activities of communists in the United States. The committee states that manganese imports from Russia have hurt the American manganese producing industry and that the American anthracite, lumber and other industries are apparently threatened by Russian imports. Statement is made by the committee that communists have succeeded in weakening and virtually breaking up and destroying a number of important labor unions in the American Federation of Labor, notably in the mining trades.

St. Joseph Lead Starts Zinc Plant

The electrothermic zinc plant of the St. Joseph Lead Company, near Rochester, Pa., 25 miles down the Ohio River from Pittsburgh, was placed in operation during January. Zinc oxide for use in paint pigments and other uses and slab zinc will be made at the plant.

Concentrates for the new plant, which at capacity will handle about 800 tons weekly, will be supplied by the company's Edward mine in New York State. A large, rich zinc mine has been developed there, which can produce zinc at a very low cost. Zinc from these mines has been going to other companies on contracts up until recently.

Only 8 Fatalities in Tri-State District in 1930

There were only eight fatalities in the mines of the Tri-State District in 1930 as against 22 in the previous year, according to the Tri-State Zinc and Lead Ore Producers' Association.

Fall of rock accounted for five of the fatal accidents, with hoisting, injury followed by complications and falls of persons each accounting for one fatality.

Over a period of six years 40.96 percent of the fatal accidents in the mines have resulted from fall of rocks. Handling powder and detonators has accounted for 10.84 percent of the fatalities in the six-year period. Last year

was the first year since the starting of the association's accident prevention campaign that at least one fatality has not been credited to handling of powder or detonators.

"A check-up on the average number of men employed for 1930 shows 25 percent less than in 1929, while the fatalities have been reduced 65 percent compared with 1929," concludes the bulletin.

The above statistics were compiled from reports received from 25 companies employing 3,940 men, or approximately 80 percent of all the men employed in the mines of the district during the year 1930.

Three mines of the Commerce Mining and Royalty Company worked throughout the year 1930 without an employee suffering a lost-time accident. The mines, with the shifts worked during the year, follow: Scammon Hill, 14,711 shifts; West Side, 17,344 shifts; Wilbur, 26,030 shifts.

Thirty-one properties of 11 companies reporting to the accident prevention department of the Tri-State Zinc and Lead Ore Producers' Association worked throughout the month of December without a lost-time accident.

Morenci Branch Wins Phelps Dodge 1930 Safety Contest

The Morenci Branch led all other units of the Phelps Dodge Corporation in the 1930 safety contest. Only 10 time-lost accidents occurred at this branch during the entire year.

The Moctezuma Branch of Nacozari, Mexico, ranked second in the standings with 19 time-lost accidents during the year and the Copper Queen was third with 29 time-lost accidents. The Old Dominion Company, of Globe, was fourth place with 13 time-lost accidents and the Stag Canon Branch of Dawson, N. M., last with 18. The rating of the various branches is figured on the basis of number of employees and 1,000 shifts worked.

The Morenci Branch, which scored a perfect record at various times during the year by presenting no time lost accidents during a month's period, ended the year with a clean slate during December.

Only six time lost accidents were recorded among all branches during December. The Copper Queen Branch was second with 1; the Old Dominion

Company fourth with 1, and the Stag Canon unit last with 3.

All 6 accidents during December occurred in the underground mining division, all other departments scoring a perfect record during the month.

Figured on the basis of 1,000 shifts worked, the rating of the Morenci Branch for 1930 was .025, that of the Moctezuma .040, the Copper Queen .043, the Old Dominion .053, and the Stag Canon .168. A total of only 89 time-lost accidents occurred in all branches during the year, a figure considerably below that of the previous year.

W. P. Yant Appointed Supervising Engineer of Bureau of Mines, Pittsburgh Station

W. P. Yant, of East Sparta, Ohio, has been appointed supervising engineer of the Pittsburgh Experiment Station of the United States Bureau of Mines, it is announced by Scott Turner, Director of the Bureau. Mr. Yant succeeds G. St. J. Perrott, who has accepted a position on the research staff of the A. O. Smith Corporation, Milwaukee, Wis.

Mr. Yant graduated from the College of Wooster, Wooster, Ohio, in 1918. Immediately following graduation, he joined the staff of the Chemical Warfare Service at American University, Washington, D. C., and was assigned to work on the development of gas mask absorbents for war gases. He joined the gas laboratory staff of the United States Bureau of Mines in 1920 and was assigned to problems pertaining to mine, industrial, and fuel gases. In 1923 he was appointed chemist-in-charge of the Bureau's gas laboratory and in 1925 he became supervising chemist of the health laboratory section, which comprises the gas laboratory; gas mask and respirator laboratory; pathological, physiological, and biochemical laboratory; and the stream pollution laboratory of the Bureau of Mines, Pittsburgh Experiment Station. In this capacity he has been in direct charge of research and service work of the Bureau which pertains to the examination of mine and tunnel atmospheres from the viewpoint of mine ventilation, control of mine fires, and investigation of explosions.

Mr. Perrott joined the staff of the Bureau of Mines in 1917 to engage in gas mask research. Early in 1918 he

was commissioned a first lieutenant in the Chemical Warfare Service and placed in charge of a unit of the gas mask research section. At the end of the war, he returned to the Pittsburgh Experiment Station of the Bureau of Mines, with which he has since been continuously connected, except for about a year in 1920-21. During this time, he put into practice in Colorado, Peru and Mexico the fundamental factors affecting the explosive properties of liquid oxygen explosives which he had worked out with the Bureau. In 1925 Mr. Perrott was appointed assistant chief explosives chemist and placed in charge of the Explosives Section of the Pittsburgh Experiment Station. In 1927 he was made superintendent of the station.

Decrease in December Copper Result of Curtailment Program

A decrease in December of 2,657 tons of refined copper stocks, and a similar decrease in blister copper stocks, are seen in trade circles as the effects of the producers curtailment plan agreed upon in November.

The December decrease in refined stocks was the first monthly decline of stocks on hand reported in 14 months. The amount on hand as of January 1 was placed at 367,832 short tons by the American Bureau of Metal Statistics. The aggregate 14 months ago was only 88,401 tons.

Blister copper stocks as of January 1, the smallest in several years, totaled 218,799 short tons, a drop of 5,732 tons from December 1.

The combined stocks of refined and blister copper in North and South America on hand January 1 were estimated by the bureau at 585,974 short tons, a decrease of 8,389 tons from stocks on hand December 1, and a decrease of 19,101 tons from those on hand November 1.

Total shipments in December totaled 109,023 tons, compared with 107,000 tons shipped during the previous month. Production of refined copper decreased. The bureau placed refined copper production for 1930 at 1,459,370 short tons, against 1,811,857 tons in 1929.

21 Fatal Accidents in Arizona Mines in 1930

Twenty-one fatal accidents occurred in mines of Arizona during 1930, Tom C. Foster, state mine inspector said in his annual report.

The mines now have 2,488 men employed in surface work and 6,475 underground. A year ago 3,030 were engaged in surface work and 11,499 underground.

COLORADO ASSOCIATIONS HOLD MEETING

The annual convention of the Colorado Chapter of The American Mining Congress and the Colorado Mining Association, held at Denver January 21 and 22, was a very successful one. The first day was given over entirely to the consideration and discussion of matters pertaining to safety and compensation. A discussion of economic conditions facing the mining industry occupied the second day of the meeting.

During the last few years the safety records in the metal mines of Colorado have not been as good as in previous years, and the National Rating Bureau recommended that the compensation insurance rate be increased. At a meeting held last August a committee was selected to study the situation and make recommendations at the annual meeting as to how safety could be improved and the compensation insurance rates lowered. This committee had been active for many months, and the day before the annual convention had met with mine foremen and safety engineers from almost every mining district in the state and from all of the principal mining companies. This accounts for the reason why safety was given such a prominent place on the program this year.

The morning session was devoted to the consideration of compensation, and Thomas Annear, president of the State Industrial Commission, was the principal speaker. George M. Taylor, a former mine operator of Colorado, presided as chairman. In his remarks Mr. Annear told of the development of the compensation insurance law in Colorado. He stated that in all other industries except metal mining the costs of compensation were passed on to the consumer. Metal mining, he said, was considered a hazardous occupation, and it behooved the mining men to adopt extreme measures to increase safety in their operations, first on account of the humanitarian problems involved, and, second, in order to reduce costs.

Following this, Harold C. Thompson, actuary of the Colorado Compensation Insurance Fund, delivered a paper covering the experiences of the metal mining section of the fund. He explained that the State of Colorado through its compensation law created the Compensation Insurance Fund that was underwriting compensation hazards of the different industries of the state; that each industry, such as metal mining, was separated from the rest; the premiums were based upon the experience record of that particular industry, and the reserves that were credited from the payment of premiums were used for the benefit of the industry involved. He

showed that during the earlier years following the establishment of the Compensation Insurance Fund that the metal mining industry had built up a comfortable surplus, but that during the last four years the fund had been compelled to pay out on compensation losses more than 99 percent of the money received from premiums.

At noon, following these two addresses, the mining men and their guests met at a safety luncheon at the Adams Hotel. Arthur N. Sweet presided as toastmaster, and after the meal was served he called on many of those present, who made short talks that added to the pleasure of the occasion.

At 2 o'clock the convention again convened, and the afternoon session was given over to a discussion of safety. The first address was made by John T. Joyce, Commissioner of Mines of Colorado, who told of the work of the state mining inspectors and advocated that they be given more authority.

The second address was made by Daniel Harrington, chief engineer of the Safety Department of the U. S. Bureau of Mines. Mr. Harrington reviewed the safety work that had been carried on by other mining companies, and made the bold statement that metal mining operations could be carried on without accidents. He brought out forcibly the fact that there is no easy road to accident prevention; that it takes consistent hard work from the president of the company to the humblest workman to carry on a no-accident operation. He stated that all the efforts that could be possibly expended to reduce accidents were justified both from the humanitarian standpoint and also for the efficiency and the lowering of costs in the operation itself.

Following the remarks of Mr. Harrington, there was an address made by William J. Coulter, general superintendent of the Climax Molybdenum Company. Mr. Coulter chose for his subject, "Safety from the Standpoint of the Operator," and he brought out forcibly the advantages of safety to the operator, if safety is made one of the principal objectives of a mining company.

The next speaker was E. J. Rowe, safety engineer of the Empire Zinc Company. Mr. Rowe spoke on the "High Lights in the Development of Mine Safety." Following this address, J. J. Shaw, general manager of the Sunnyside Mine, gave the report of the Safety and Compensation Committee, in which he pledged the best efforts of the mine operators of Colorado to carry on a vigorous campaign for the elimination of accidents, and the committee made certain recommendations covering the compensation insurance laws: first, that

all of the metal mining operations should be put on a merit system of rating; and, second, that part of the cost of compensation should be paid by the labor employed in the metal mines. It was the opinion of the committee that the miner and other laborers in the metal mines were as much a part of the industry as the operators themselves, and that the cost of compensation in most states had risen to such an extent that it was acting as a damper to discourage metal mining. The report of the committee was unanimously adopted.

The second day of the convention was given over to a discussion of economic conditions facing the mining industry. Charles W. Henderson, the district engineer of the U. S. Bureau of Mines, was called upon to read a paper of Dr. B. S. Butler covering the progress of the U. S. Geological Survey in Colorado. In his report Dr. Butler outlined in detail what had been accomplished in this co-operation since its inception in 1926. Fifteen reports have been prepared and published. Several reports are now in the editor's hands in Washington, and several more are in the process of preparation. Dr. Butler looked upon this co-operation as highly satisfactory, and felt encouraged in that this work would be of great value to the mining industry and to the citizenship of the state.

George E. Collins then presented a paper covering the "Economic Condition of Metals," and Harold W. Lowrie, Jr., presented a paper covering the "Economic Situation of Petroleum." Both of these speakers reviewed these subjects thoroughly. Dr. Henry Mace Payne, consulting engineer of The American Mining Congress, was then called upon to discuss "The Flow of Goods Survey." Dr. Payne delivered a very instructive and entertaining address, telling how The Flow of Goods Survey had worked in Kentucky, and what it had accomplished for that state. He advocated the development of every little town and hamlet in the state; in other words, the diversification of the industry, rather than its concentration. Dr. Payne's remarks met with the unanimous approval of the convention.

W. P. Redding, of the Denver Chamber of Commerce, made a few remarks regarding the "Buy-It-In-This-Market" movement of the Chamber of Commerce; and Joseph F. Little, chairman of the Mining Committee of the Junior Chamber of Commerce, pledged the support of its organization in putting over a bigger and better convention next year, which will be held in Colorado Springs.

At the afternoon meeting, Col. A. S. Peck, of the Forest Service, delivered an able address covering the development of the Forest Service and mining. He stated that the mining law gave the locator the privilege of going into the for-

ests and staking mining claims wherever he chose, and if he could discover mineral he could hold those claims over any other contestant. He told of the various services rendered by the Forest Service, of grazing permits, of summer homesite permits, and of the methods of selling timber; and he thought that, in the interest of the forests, that the mining men should work out a plan so that the location of mining claims would not be used by unscrupulous people to get control of the forest lands for other purposes than mining.

Barney L. Whatley delivered an address on "The Narrow-Gauge Railroad Situation of Colorado." Mr. Whatley reviewed the fact that these railroads were built during the boom mining days for the purpose of reaching a new mining camp in the quickest possible time; that these railroads generally have narrow curves and steep grades; that during the last 50 years very little money has been spent on them for improvements; that the equipment is out of date, and that these narrow-gauge railroads are a source of expense rather than revenue to the big railroad systems that own them. At the present time there is a movement on foot to abandon these narrow-gauge railroads, but they serve the people in the heart of the state, and if they are abandoned the depression in value of property served by these railroads will be tremendous. It was his opinion that the narrow-gauge railroads are needed, and that the people should cooperate with the railroads by giving them more business, and the railroads should cooperate with the people by modernizing these railroads and giving better and cheaper service.

Following these addresses, there were reports from the Power Committee, and also from the Resolutions Committee. The convention adopted resolutions for the benefit of silver, for the suspension of the annual assessment work for the years 1930 and 1931, and for other matters pertaining to the industry.

The convention climaxed in the Annual Sowbelly Dinner, held in the Hall of Colorado, the main dining room of the Cosmopolitan Hotel. About 600 partook of these festivities. The Colorado School of Mines Band rendered selections all during the meal. This dining hall was referred to humorously as the Cosmopolitan Mine Boarding House, conducted by Mrs. Murphy, and the menu consisted of the good old Cornish pasty, with side dishes of sowbelly and beans. In addition to the jokes, the entertainment and the humorous incidents, there were three serious speeches: the first by James F. Callbreath, secretary of The American Mining Congress, discussing "Silver, and Its Economic Position in the World." Mr. Callbreath brought out that the Asiatic nations had been consumers of sil-

ver from the early dawn of history; that these people had bought our silver for around a dollar to \$1.25 an ounce, and it was their standard of wealth; that it was not fair to these people that silver has been allowed to depress in value until today it is only worth 30 cents an ounce. Mr. Callbreath advocated an agreement between the nations that would standardize silver at a fixed value, and he stated that this would go a long ways in removing the depression that now has the world in its grip.

Daniel Harrington, chief engineer of the U. S. Bureau of Mines Safety Division, presented the Joseph A. Holmes Association medal and certificate to William Cowan, who had saved the lives of six miners in the fire at the Terrible Mine in 1928.

Dr. Henry Mace Payne, consulting engineer of The American Mining Congress, delivered a stirring address on "The Value of the Pay Roll."

This sowbelly dinner ended one of the most enjoyable and constructive annual meetings ever held by the mining men of the state.

Bethlehem Steel Quarry Operates Two Years Without Accident

Two years without a single lost time accident is the exceptional safety record of the Hanover Quarry of the Bethlehem Steel Corporation.

During the years 1929 and 1930 the number of hours worked totaled 476,424. In view of the many hazards in this type of operation, the record of two complete consecutive years with no accidents whatever is regarded as exceptional.

In the two preceding years there were ten lost time accidents including one fatality for a total of 624,421 hours worked.

"The record at Hanover indicates the value of intensive safety effort, even with small operations," said M. L. Jacobs, manager of quarries for Bethlehem. "The operation at Hanover is a limited one, with about 100 persons employed, but the accident situation always comes down to the personal equation and the care of one worker or 100 workers is just as important as the care of 10,000."

"Our accomplishment during the past two years may be credited to the excellent safety program handled by our employees who have their first aid teams, competitions and first aid work, and very thorough training in accident prevention activity."

The system was developed at Hanover with the cooperation of Thomas J. Quigley, chief, mines and quarries section, Department of Labor and Industry, State of Pennsylvania, in collaboration with J. E. Culliney, manager of safety for Bethlehem, and C. R. Orndorff, superintendent of the Hanover quarry.

Noah H. Swayne Heads Burns Bros., Resigning Anthracite Institute Position

On January 9, Noah H. Swayne, executive director of the Anthracite Institute, was elected president of Burns Brothers, New York City, considered the largest retail coal company in the world. On the following Monday he resigned his position as executive director of the Anthracite Institute. Mr. Swayne succeeded Sanders H. Wertheim as president, who resigned on account of ill health.

Upon the retirement of Mr. Swayne as executive director of the Anthracite Institute, C. A. Connell, for some years general manager of the Anthracite Service, was chosen to succeed him as acting director. Mr. Connell is well known throughout the anthracite-consuming territory through his activities with anthracite service, and is thoroughly familiar with the problems confronting the industry.

Mr. Swayne was for many years director and president of various iron and coal mining companies and engaged in the coal business in Philadelphia. For the last two years he has been administrator of the Philadelphia Retail Coal Conference, comprising the majority of the coal merchants of Philadelphia. For the last year he has been executive director of the Anthracite Institute, in charge of the joint activities of the producers of approximately 90 percent of Pennsylvania anthracite.

Kansas-Missouri Miners and Operators Sign Four-Year Pact

A four-year wage agreement for coal mines in the Kansas-Missouri field was agreed to in January following a series of conferences between the Southwestern Interstate Coal Operators Association and the United Mine Workers. The contract which was signed January 21, renews the wage scale and working conditions of the last three years, and is effective April 1, according to W. L. A. Johnson, general commissioner of the operators organization.

The wage scales range from \$5 to \$5.51 a day for day men with various tonnage rates for piece work. Certain amendments offered by both sides affecting conditions of employment, rules and regulations were mutually agreed on.

Mining Companies Form Own Sales Organization

The Sovereign Pocahontas Company, a strictly sales organization, has been incorporated under the laws of West Virginia, with main offices in Bluefield. The company will handle the production of the Pemberton Coal and Coke Company, Ashland Coal and Coke Company, Buckeye Coal and Coke Company, Ma-

jestic Collieries Company, and the Iroquois Coal Mining Company. The officers of the new company are W. J. Richards, chairman of the board; W. A. Richards, president; W. C. Stephens and J. E. Westervelt, vice presidents.

Colonel Ernest Chilson Dies

Col. Ernest Chilson, vice president and general manager of the Raleigh Coal and Coke Company, died January 4, in his home in Raleigh, West Virginia. He had been ill for more than a month. Physicians gave angina pectoria as the cause of his death.

Colonel Chilson was born in Williamsport, Pa., 61 years ago. He was educated in the public schools of that place and in Dickinson College. After graduation he went to work for one of the big coal companies and has never since left that business.

He came to West Virginia in 1899 as general superintendent of the Southern Coal and Transportation Company in Barbour county.

In 1906 he went to Raleigh to take charge of a small mine which employed about 150 men and produced about 150 tons of coal annually. Under his direction the list of employees grew to 1,000 and the production is estimated at 1,000,000 tons a year.

Colonel Chilson was reputed to know personally every man in his service and to have had an active interest in their and their families' welfare.

Colonel Chilson was the moving spirit behind the building of the Black Knight Country Club. He was in charge of the planning and erection.

Casa-Loma, home of the late coal operator, is one of the show places of Southern West Virginia. The house, set back in a beautiful garden high up on a hill, overlooks the model mining town of Raleigh.

Colonel Chilson is survived by his widow and one daughter.

Trade Commission Dismisses Complaints Against Coal Associations

Complaint against three coal dealers' associations whose members operate in Idaho, Utah, Montana, Oregon and Washington, regarding alleged unfair competition in the sale of coal, have been dismissed by the Federal Trade Commission. Those against whom the charges have been removed are the Idaho Coal Dealers' Association, composed of 250 member dealers or branches of dealers in 89 Idaho towns, 23 dealers or branches in 10 Oregon towns, 2 dealers in Washington, 2 in Montana and 1 in Salt Lake City; the Utah Coal Producers' Association, composed of 13 member companies with headquarters in Salt Lake City; and the Retail Fuel Dealers' Association of Utah, of Salt Lake City, consisting of 50 member companies.

Oliver J. Grimes Named Managing Director of Coal and Heating Equipment Committee

Oliver J. Grimes, for two years Executive Secretary of the Utah Coal Producers' Association, has been named Managing Director of the Committee of Ten—Coal and Heating-Equipment Industries. Headquarters of the committee will be in Chicago, 307 North Michigan Avenue. Mr. Grimes, who has resided for 21 years in Salt Lake City, where he has a distinguished record as a newspaper editor, secretary to two governors and a member of the State Board of Equalization, will commence on his new duties March 1. The headquarters will also serve as the Chicago office of the National Coal Association, of which Mr. Grimes will be in charge.

This announcement was made at a meeting of the Committee of Ten, held January 14, in Chicago. Chairman H. A. Glover, who made the announcement, stated that Mr. Grimes, who was one of many who had been considered for the work, was eminently fitted to develop the program of coordination between the coal and heating-equipment interests.

Applications on the part of interested coal producers and retailers for meetings in their respective localities are being received in large number, and among the larger cities where meetings will be held this spring are Minneapolis, Omaha and Pittsburgh, at each of which places permanent organizations of coal and heating-equipment interests to promote improved heat service through coal, of the type of the Cincinnati organization, will be set up.

It was decided to ask producers and retailers to furnish the committee with data respecting tests of stokers and oil burners. The Chicago Coal Merchants' Association, at its own expense, recently engaged the services of the Commercial Testing and Engineering Company, Chicago, to test the operation of oil burners and stokers at the East Gate and St. Clair Hotels. The oil burners with which those hotels were equipped, were tested, and then stokers were put in, operating with the same boiler, same load, and under exactly the same conditions. In each case the test, which ran 24 hours, showed the stoker had a higher efficiency than the oil burner and the savings were as high as 35.7 percent.

Federal Trade Commission Investigates Natural Gas Propaganda in Alabama

The Federal Trade Commission is investigating the charges that the fuel value of Alabama coal has been misrepresented by the distributors of natural gas in that section of the country, and D. W. Gatling, an attorney-examiner of

the Commission, has been sent into that territory to make the investigation. The Alabama Mining Institute laid before the Commission documentary evidence tending to show that the coal industry had been misrepresented by the sponsors of natural gas. It was specifically claimed by the gas people that no coal in Alabama had as high a B. t. u. content as 14,000, whereas it is shown from reports of the Federal government that approximately one-half of the commercial coal in Alabama exceeds 14,000 B. t. u. per pound and that the allegations of the gas people are unfair and have a tendency to confuse the public.

Carriers and Coal Men of the Northwest Meet to Formulate Plans to Combat Natural Gas

In response to request from the Northwestern Retail Coal Dealers Association, Minneapolis, Minn., 26 railroad, six dock, seven all-rail, and eight retail representatives were present at a conference held January 22 at Minneapolis, the avowed purpose of which was to devise ways and means of preventing natural gas from displacing coal for fuel and manufacturing purposes. The conference was opened by Wesley E. Keller, secretary of the association, who cited the loss of the trade to natural gas and then asked for discussion of the problem from every angle. The majority of the speakers stressed the importance of a united front, and declared small stokers to be a boon to the preservation of the domestic market. They also urged dealers to know the right coils for the different stokers and favored the marketing of dustless coal. It was pointed out, also, that the decline in the coal movement was partly due to increased burning efficiency as well as to gas lines. The conference voted to appoint committees from the railroad, dock, retail, and all rail interests, the appointments to be made by the groups themselves, to seek workable solutions for the problem. It was the expressed opinion of the railroad men that the railroads could not contribute money to a proposed advertising campaign to educate the public to the advantages of coal.

Public Lands Report Completed

President Hoover has received and is expected to shortly send to Congress the report of the Committee on Administration and Conservation of the Public Domain appointed by him more than a year ago. It is understood the commission recommends that government agencies handling administration of national reserves and the conservation of their resources be consolidated, and that the government reserve the minerals in public lands to be transferred to the states.

Government Agencies Make Reports on Russian Anthracite Industry

Reports of the Department of Commerce on labor in the coal fields of Soviet Russia and of the Tariff Commission on the anthracite industry of that country have been made public by the House Committee on Ways and Means, which is considering legislation to restrict Russian imports. The Department of Commerce report describes the labor situation in Soviet industry in general and in the Donetz Basin coal mines in particular. The conclusions of the department are as follows:

The coal mines of Russia, as the foundation of the industrial development of the country under the five-year plan, are considered by the Soviet government of supreme importance and the continued increase of production as imperative.

Under the principles of communism, it is the duty of each inhabitant to contribute to the general welfare voluntarily or against his will. Conscription of workers has been used by the Soviet government in the early period of militant communism, and is seemingly being again put in effect by edicts during the last few months.

Complaints are continuous in the Soviet press of poor housing, shortage of necessities, high turnover and inefficiency of labor. Attempts are being made by the Soviet government to remedy these defects but results so far are unsatisfactory. A low wage scale prevails in Soviet industry but cash wages are supplemented by quarters, light and heat by the employing agency either free or at low cost; of clothing, food and other necessary supplies at low cost, and of insurance, hospitals, clubhouse and other social benefits, which are regarded as part of the real wage.

Industry in Russia is endeavoring to reach great heights of production and labor discipline has been tightening in every field. Resources and efforts of the country are being massed in an attempt to fulfill a program that will draw or force every worker to put forth maximum performance.

In its report on the Russian anthracite industry, the Tariff Commission says:

"The Soviet government has adopted laws and measures regarding laborers who leave their employment. Applicants for employment are subject to certain disabilities if they refuse positions offered. These measures would have a different significance where industry and trade are mainly in private hands. In Soviet Russia the bulk of the mining, manufacturing and transportation industries is in the hands of the government. None of the laws or regulations examined contain any specific provision to prevent a worker in government industries from returning to the farm or seeking employment in such private enterprises as may exist.

"Russian industries are suffering from a severe shortage of coal and the program of industrial expansion calls for a larger home consumption of coal in the near future. Because of the distant lo-

cation of Siberian coal reserves, the demands upon the Donetz reserves will be heavy, and the expansion of coal production may be unequal to the industrial requirements of Soviet Russia. The productive resources of the Donetz Basin appear to be taxed beyond their present capacity. Future development of coal exports by Soviet Russia, however, can not be foretold."

Reference is made to the recent recruiting of 55,000 laborers for the Donetz coal fields for at least six months and not less than a year's service, and measures issued against labor turnover.

In giving imports of Russian anthracite into the United States since 1922, the report states the lowest receipts were 105,280 tons in 1924 and the highest 726,746 tons in 1926, and the value per ton ranged from \$7.20 in 1922 to \$9.63 in 1926. Similar figures of exports of American anthracite are given, showing a minimum of 2,649,000 tons in 1922 and a maximum of 5,090,000 tons in 1923.

The commission estimates the coal reserves of Russia at 475 billion tons. The Donetz Basin area is the most important developed field and is the source of anthracite shipped to the United States. The reserves of this field are estimated at 68,167,000,000 tons of which 39,599,000,000 tons are classed as anthracite and 28,568,000,000 tons as bituminous. "These anthracite deposits are over twice as large as the remaining anthracite coal reserves of Pennsylvania, which amount to 15 billion tons, about two-thirds of the original deposits," says the commission. "Efforts are being made to develop new mines but difficulties have arisen. An insufficiency of engineers and skilled and common labor exists. The largest Russian coal fields are in Siberia, too distant from Russian industrial centers for commercial exploitation."

The per capita production of coal in Russia in the year ending September, 1929, was one-fourth ton as compared to five tons in the United States.

As to cost of production of coal in the Donetz Basin the commission says that for the year ended September, 1929, it cost 10.41 rubles to produce a ton of Russian coal (ruble valued at 51.46 cents). In the last quarter of the year ended September, 1930, it is said the cost increased "owing to decreased efficiency of coal cutting machines and the disorganization of labor." Wages were 54 percent of the production cost in the year ending September, 1929.

Values placed by the Russian government on anthracite in 1929 and the first two months of 1930 ranged from 9.38 to 9.93 rubles per ton, for an average of 9.63. For the same period the value of imports of Russian anthracite in the United States ranged from \$5.86 to \$6.98 per ton, for an average of \$6.53. Ocean freight rates on Russian

anthracite to the United States in 1929 ranged from \$4.06 to \$4.14 per ton, according to Russian authorities, while the Department of Commerce is quoted as saying that early in 1930 the rates ranged from \$3.50 to \$4 per ton, and on particular cargoes was as low as \$3.15 last November.

Taxes Paid By Mining Companies

Mining and quarrying corporations paid total Federal income taxes of \$36,751,194 in 1928, which was 11.05 percent of their net income of \$332,678,721 and 3.10 percent of taxes paid by all corporations, according to statistics of income for that year issued by the Internal Revenue Bureau. The taxes were paid by 5,183 corporations, who had deductions of \$2,168,789,763 from gross income of \$2,501,468,484. The companies had \$19,151,653 net loss for the prior year.

There were 7,750 companies which had no net income. These companies had gross income of \$1,087,744,849 and deductions of \$1,295,160,594. No income data was reported by 5,860 inactive corporations.

The report shows that 1,112 individuals with net income of \$5,000 and over had net profits from mining and quarrying to a total of \$10,716,201. There were 1,494 individuals having net income under \$5,000 who reported net profit of \$3,752,165 from mining and quarrying.

A total of 229 consolidated returns for affiliated corporations in mining and quarrying showed gross income of \$1,436,172,349; net income of \$180,925,723; and net loss for prior year \$10,803,712. These companies paid income taxes of \$20,378,674. There were 297 consolidated returns which reported gross income of \$506,669,177, but a deficit of \$55,796,948.

Metal mining companies—iron, copper, lead, zinc, gold, silver and quicksilver—paid the largest tax in the mining group, \$13,816,181, followed by payments by other branches of the industry as follows: oil and gas, \$9,318,026; bituminous, lignite, peat, peat, etc., \$3,441,860; asbestos, clay, granite, precious and semiprecious stones, salt mines, etc., \$6,086,240; mining lessors and holders, \$2,410,758; anthracite, \$1,678,129.

Detailed statistics for the branches of the mining industry are given as follows:

Metal mining—taxes paid by 318 companies who had gross income of \$846,883,852; net income, \$122,742,237; prior year net loss, \$7,060,682.

Anthracite—53 taxpayers, gross income, \$183,961,652; net income, \$14,415,376; prior loss, \$379,399.

Bituminous—863 taxpayers; gross income, \$517,596,601; net income, \$33,477,073; prior loss, \$3,695,904.

Oil and gas—1,686 taxpayers; gross income, \$543,541,303; net income, \$85,544,646; prior loss, \$5,889,483.

Asbestos, etc.—1,110 taxpayers; gross income, \$349,200,630; net income, \$53,994,987; prior loss, \$1,179,528.

Lessors and holders—1,153 taxpayers; gross income, \$60,284,447; net income, \$22,504,402; prior loss, \$946,657.

Mining corporations reporting no net income were as follows: 814 metal with

gross income of \$139,028,060 and a deficit of \$28,363,827; 73 anthracite with gross income of \$166,615,211 and a deficit of \$9,163,936; 1,842 bituminous with gross income of \$431,741,612 and a deficit of \$57,985,403; 2,399 oil and gas with gross income of \$218,847,310 and a deficit of \$82,063,178; 988 asbestos, etc., with gross income of \$84,595,386 and a deficit of \$13,022,077; 1,634 lessors and holders with gross income of \$46,917,270 and a deficit of \$16,817,324.

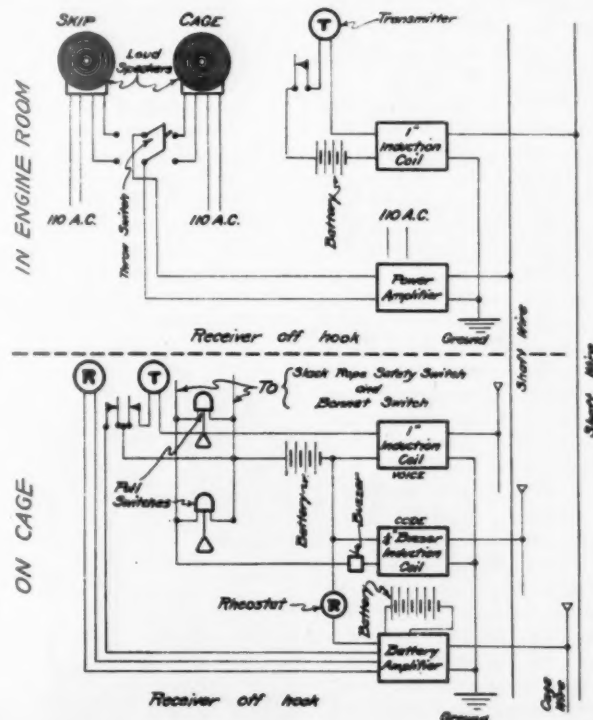
A NEW SIGNALING DEVICE FOR SHAFT MINES

Oglebay Norton & Company, Ironwood, Mich., under the direction of L. D. Stewart, has run a series of experiments and tests on a new signaling device for cage operation which will fill a long-felt want in the mining industry, a signaling system that, first, provides safety; second, is economical to install, and, third, increases efficiency both in the operation of the cage and in shaft inspection and repair work. The safety feature is particularly interesting in that it is impossible to give a signal to the engineer except from the cage itself. A second safety feature is that if the cage, when lowering, should become stuck in the shaft, this system will automatically give the stop signal at the instance of such an occurrence. This is readily seen by looking at the accompanying wiring diagram. The system is also practically fool-proof and very simple in principle and can be installed by any mine electrician. It can be installed as a simple one-way code signal system, capable of

giving signals from the cage to the engineer, using only the old return system for return signals. For this type of signal an ordinary Ford spark coil with an amplifier and loud speaker is all that is necessary in the way of equipment.

However, as this equipment is being installed by the Oglebay Norton properties in addition to the code signal, there is a talking circuit in connection for two-way communication. Either code signaling or talking can be carried on at any point in the shaft whether the cage be moving or not. The talking circuit complicates the system a little, in as much as it is necessary to clear the system of noise. This is accomplished by the use of condensers which will have to be determined at each installation due to the different capacities of the line wires installed at such installations.

(A more detailed description of Mr. Stewart's signaling system will be furnished to any one interested.—THE EDITORS.)



WITH THE MANUFACTURERS

New "Clarkson Loader" Announced

The Clarkson Manufacturing Company, of Nashville, Ill., announces a new mechanical loader known as the "Clarkson Loader," designed by John L. Clarkson, the president of the company.

The head of the Clarkson Loader consists of a 24-in. I-beam section which, in addition to serving as a conveyor, is also used as a base for construction. At-



tached to the sides of the I-beam are side plates and heavy $\frac{3}{4}$ -in. angle irons—these forming the foundation for the gathering head motor which is directly under the rear end of the conveyor.

Two $\frac{3}{4}$ -in. plates, measuring approximately 48 in. long and set at an angle to the I-beam conveyor, constitute the loading head proper. On this head are two gathering chains which, mounted on either side of the conveyor, are geared so that they revolve in opposite directions to one another.

As these chains revolve around the head, large, sharply pointed picks (measuring 10 in. in length) do the work of disengaging stubborn pieces of coal. The coal, thus loosened, is transferred from the side and front of the conveyor and carried upward until it reaches the belt conveyor, which has its front pulley just 14 in. from the end of the loading head.

The front head on a Clarkson Loader can be raised or lowered at the will of the operator. This is made possible by two $3\frac{1}{2}$ -in. hydraulic jacks mounted on either side of the head and directly over the ring of the front bumper. By means of this feature, the operator is enabled to follow the floor of the mine and to adjust the digging head so that it will not disturb the fire clay bottoms.

Ingenious Design in New Variable Speed Transmission Offered by Link-Belt

What is claimed to be the first all-metal variable-speed transmission on the market has recently been announced by the Link-Belt Company. It is called the P. I. V. Gear, the initials standing for "Positive Infinitely Variable."

Basically, this new speed change unit consists of two pairs of wheels of the opposed conical disc type, between which a unique chain transmits power. The effective diameters of each pair of wheels can be altered under load to change the speed ratio, without steps and without dependence upon friction. On changing speed, the self-pitching chain rises in one set of wheels and descends in the other, so that while the input shaft connected to a motor or other source of power turns at constant speed, the output shaft is brought to the desired R. P. M.

Variable-speed devices employing adjustable conical discs and belts with side friction contacts have been used for some time. The wholly original feature of the P. I. V. Gear is its use of a positive chain drive to transmit the power. Radial teeth are cut in the conical faces of the driving discs, and the self-adjustable teeth projecting beyond the sides of the chain are arranged to positively engage the radial teeth of the discs.

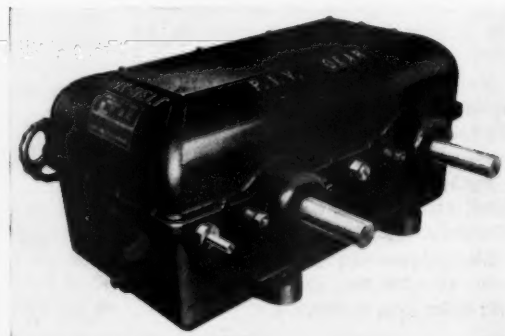
The chain used in the P. I. V. Gear is made up of a series of steel leaves or links with joints consisting of hardened steel pins turning in segmental bushings. There are no teeth on the inner surface of this chain. Instead, what may be called teeth are made up of packs of hardened steel laminations or slats which extend through slots in the links at right

angles to them, and project about $\frac{1}{8}$ inch at each side of the chain. The individual containers which hold the packs of slats are secured in the openings of the links, but, within each such container, the slats are free to slide from side to side individually with relation to each other and adjust themselves to engagement with the radial teeth of the discs, over substantially the full range of diameters.

The teeth of the discs widen from the center outward toward the circumference, but are of uniform depth. They are so staggered relatively on each pair of wheels that the slats move back and forth into the teeth to mesh correctly as the chain comes into contact with the wheels. Self-pitching of the chain to any tooth width or wheel diameter is thus assured.

All elements of the P. I. V. Gear are built into and protected by a compact oil-tight housing, and are automatically splash lubricated. The hardened steel wheel faces are mounted on cast-iron hubs backed by ball thrust bearings, and move axially on the shafts, which in turn are mounted in radial ball bearings. The movement of the pairs of wheels together or apart, in order to increase or decrease their effective pitch diameters, is controlled by a pair of pivoted levers operated through a hand control shaft with right and left-hand screw motion. Initial chain tension is provided for by an external adjustment screw, and correct operating tension is maintained at all ratio settings by two hardened shoes which ride lightly on both upper and lower strands of the chain, under constant spring pressure. A speed indicator permits ready check-up on operating speed settings.

The P. I. V. Gear has been put into production by the Link-Belt Company



for the present in five sizes, from 1 to 10 hp. capacity, providing speed change ratios up to a maximum of six to one. It has been thoroughly tested throughout the past year by continuous operation.

A book, No. 1274, illustrating and describing the Link-Belt P. I. V. Gear, will be sent gratis upon request to Link-Belt Company.

To Unify Specifications for Electrical Equipment for Gaseous Service

As the result of a meeting held in Pittsburgh on January 6, steps are being taken to unify the specifications for electrical equipment for use in gaseous places in coal mines and those for apparatus in gaseous places in refineries, gasoline pumping stations, etc. The meeting was called at the instigation of the National Electrical Manufacturers Association, and was attended by certain manufacturers of coal mining equipment and equipments to go in hazardous places other than coal mines and controlled by the Board of Underwriters, together with representatives of the Bureau of Mines. There seemed to be no logical reason for the existing differences in the specifications of the two groups, the result of which has worked considerable hardship on the manufacturer who endeavors to build apparatus for both mining and industrial work where approval of the proper authority was necessary.

A small committee consisting of L. C. Hsley, of the Bureau of Mines, Mr. Nuckolls, of the Underwriters' Laboratory, C. W. Falls, of the General Electric Company, and T. E. Barnum, of the Cutler Hammer Company, was appointed to thoroughly investigate these differences and report their findings to the general committee. The work is well under way, and a definite announcement is expected in the near future.

Ready Reference for Selection of Turbines

Complete data on the application and operation of turbines is comprehensively treated in bulletin form by the Coppus Engineering Corporation.

This bulletin gives information, not only on turbines and their operation, but also shows how to select the proper unit for each specific duty.

Aside from the working diagrams which bring out the many salient points of these turbines, a complete set of curves make it an easy matter to tell what is required of a turbine for certain duties and what size it should be. Turbines from 1 to 60 horsepower and fractional horsepower units are featured.

Copies may be obtained from the manufacturers, Worcester, Mass.

Big Laboratories Near Completion

New experimental laboratories, costing more than \$500,000, which will house the research facilities of the Hercules Powder Company at Wilmington, Del., are nearing completion. The main laboratory building and a number of smaller units have been finished and are awaiting installation of equipment.

The new location near Wilmington represents a closer contact of the company's research department and its main office, the laboratories being moved here from Kenvil, N. J. The new research laboratories will be formally opened within the next few months, it is stated by the company's officials.

H. A. Hammond, General Cable Representative, Dies in New York

Harry Albert Hammond, for many years New York representative of the General Cable Corporation, passed away January 1 at his home at 390 Riverside Drive, in that city. Mr. Hammond had long been connected with the Rome Wire Company before it became a division of the General Cable Corporation and was well known through Eastern industrial circles.

Mr. Hammond was born June 12, 1872, and had been connected with the wire concern since January, 1903, when it was a partnership of George A. Clyde and Herbert T. Dyett.

New Electric Hoist for Slushing Service

A double-drum electric hoist for slushing in metal and coal mines and for general scraping and dragline operations has been developed by the Ingersoll-Rand Company, New York. The design of this hoist is said to be a distinct departure from that of older types, and, as a result, to contain many important improvements.

This hoist, known as the Size 215, is rated at 15 hp., and will give 2,000 lbs. rope pull at 240 ft. per minute. Either alternating or direct current motors are available. The capacity of each of the drums is 300 ft. of $\frac{1}{2}$ -in. cable or 500 ft. of $\frac{3}{4}$ -in. cable.

An outstanding feature of the design is the use of a strong cylindrical steel housing which not only encloses all the working parts, but provides a rigid support for them. This insures perfect alignment of the working parts under the severest conditions of slushing service. The enclosed construction also results in safer operation.

The drive to each drum is by a three-shoe internal expanding clutch of the friction type that engages the drum smoothly and evenly. It prevents sudden overloading of the hoist parts and can be slipped to vary the speed of pull. It gives a balanced drum drive and cor-

responds to the best automotive bus and truck brake construction.

Only one drum at a time can be engaged, there is no danger of engaging both drums at the same time and locking the hoist. Both clutches are operated by a single control lever—a feature giving ease of handling.

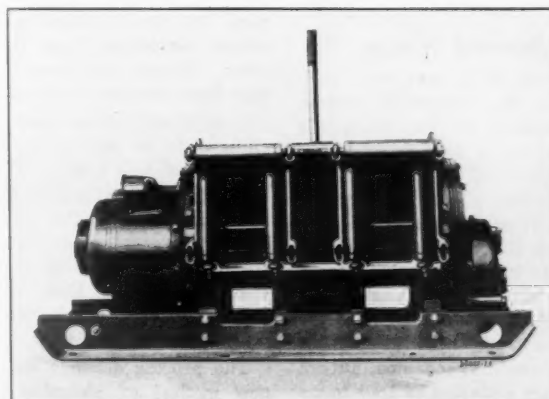
Helical stub tooth gears are used that give great strength and quiet operation. They turn in a bath of grease, being contained in a separate chamber which is tightly sealed to exclude dirt and retain the lubricant.

Each drum is fitted with a separate brake of ample size, operated by a foot pedal.

The cable guide rollers are mounted on Timken Roller Bearings and provided with grease fittings. The cable roller bracket can be tilted or inverted for winding "under." A rear cable guide and end control can be supplied for slide mountings.

The hoist is furnished complete with steel skids so that it is not necessary for a user to supply a mounting. The skids provide an excellent footing for spragging the hoist without danger of warping or springing the housing.

The new hoist is described in Bulletin 1860.



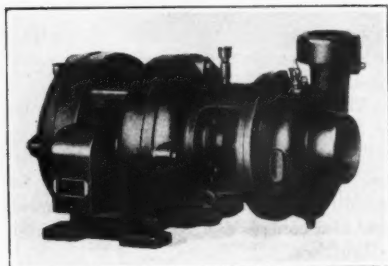
Morse Chain Has Interesting Exhibit at Midwest Power Show

Among the many interesting mechanical exhibits at the Midwest Engineering and Power Exhibit, Chicago, is that of the Morse Chain Company, Ithaca, N. Y., manufacturers of Morse silent chain drives, flexible couplings and chain speed reducers. All units are shown in actual operation in order to demonstrate as nearly as possible their silence, flexibility and efficiency. One unique display, through the use of a Neon lamp synchronized with the pitch travel of the chain, permits observers to follow the true rocker action of the Morse rocker joint.

Advances in modern chain lubrication are also shown; the display featuring the Morse Automatic Ring Oiler being especially interesting. This ring oiler delivers clean oil to the moving chain at all times—the method of doing it is surprisingly simple, yet fully efficient.

New Sizes in Centrifugal Pumps

Allis-Chalmers Manufacturing Company announces an extension to cover three new sizes in its line of "SSU" centrifugal pumping units of single-shaft, two-bearing design, which now includes ratings from 30 to 500 g. p. m. for heads under 100 ft. Recent adoption of total

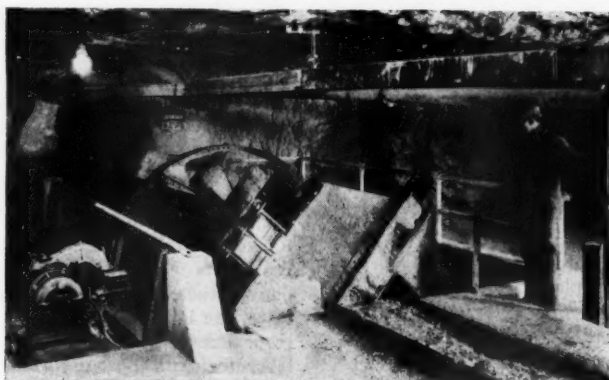


The "SSU" Pumping Unit with 3500 r.p.m. motor

enclosure of motor housings on the pump end of these units and the use of totally enclosed fan-cooled motors, if necessary, permits their use for severe service conditions.

The Lindeweld Process

A new method of oxy-acetylene welding, known as the Lindeweld process, has been introduced by The Linde Air Products Company, 30 East Forty-second Street, New York, N. Y., as a part of its process service. This new process has met with great success in the field of overland pipe line construction, where it is being used increasingly because of the remarkable speed and economy which it has made possible. Although the Lindeweld process is used at present chiefly for the welding of pipe, future developments are expected to lead to its



New RandS Shaft Type Power Car Dumper

The Roberts and Schaefer Company, of Chicago, have developed a new type of car dumper which combines a number of operating advantages important to metal mines. It is called the Shaft Type Power Car Dumper, and is used where cars are uncoupled before dumping. It consists of a cage body with a heavy shaft running the full length of the car dumper. The car dumper is mounted on heavy bearings at each end.

The drive is by an electric motor through a speed reducer and rope drum; the rope is passed around a ring channel at the center of the car dumper and is so arranged that the car dumper is overturned and returned by power. Varying loads in the cars make no difference in the operation of the car dumper. The complete drive is mounted on a common base, assuring its alignment and operation.

The operation is through push button control. By pushing the button, the car dumper rotates 180°, automatically reverses and returns to the upright position against spring buffers. This is the normal cycle of operation.

The car dumper may, however, be

stopped at any point during the rotation or may be reversed from any point. It can also be reversed part way and again rotated forward. This is a very important feature. If it is decided to "blow out" the cars, the car dumper may be rotated to remove the load and returned part way to a point where it is convenient to loosen up the material left in the car and then again rotated forward to dump the loosened material.

The accompanying illustration shows the installation at the American Zinc Company of Tennessee plant at Mascot, Tenn. This car dumper dumps two cars at a time. At this plant it is necessary that the locomotive cross over the car dumper and this type of car dumper permits the use of a trolley locomotive without difficulty.

It is necessary at this plant to "blow" the muck out of the car that does not leave the car when dumped. The car dumper is returned to about a 90° position and the muck loosened by air pressure. The dump is then again rotated to its overturn position, dumping the loosened material.

application in many other industrial welding operations.

In the welding of pipe for oil and gas transmission the Lindeweld process has resulted in savings of from 30 to 60 percent of the time required to make a weld by the methods previously employed, depending upon the size of the pipe. Oxygen and acetylene consumption have also been reduced considerably.

Consistently higher strength welds are claimed to be obtainable than by any welding process previously employed, so that no sacrifice of quality has been made for the benefit of the increased speed. In tensile tests made in the field on specimens welded by the Lindeweld process the welds have invariably out-pulled the pipe. Good ductility has also been shown in bend tests.

The process depends essentially on a new method of blowpipe manipulation

and upon the use of a new welding rod introduced for that purpose known as "Oxweld No. 24 Lindeweld Process Welding Rod."

New Lummus Company Organized

The Lummus Company, a new engineering and contracting firm having authorized capital stock of \$10,000,000, has been organized to take over the business of the Walter E. Lummus Company of Boston, Mass. The Superheater Company and the Babcock & Wilcox Company hold substantial blocks of stock in the new firm.

The Lummus Company will engage in the design and manufacture of distillation and refining equipment for the alcohol, chemical, and petroleum industries, following the lines of activity pursued by the Walter E. Lummus Company, but operating on a larger scale.



The greatest interest of coal-operating men will undoubtedly be centered in one place this spring—the Annual Exposition and Convention of the American Mining Congress at Cincinnati. Thousands will attend it and depend upon it to keep in touch with developments in equipment and methods. It is an imposing array of coal operating officials who shop from all over the country for ideas and machinery at Cincinnati. But many who are as keenly interested as those who go must stay at home to keep up production. For that reason and to furnish a hand-book for those attending, *The Mining Congress Journal* makes as complete a presentation as possible of both the exposition and convention in its May issue. It describes and outlines both fully and in detail. It carries an important advertising section printed in colors on special stock devoted to manufacturers who are contributing to progress in coal mining. This section makes an important “Pictorial Exposition.” This number is the official publication of the convention and will be distributed widely beforehand and to all attending the convention. It is an issue that is important to both coal operators and manufacturers of mining equipment.

THE MAY EDITION OF THE MINING CONGRESS JOURNAL



See How It Fits In?



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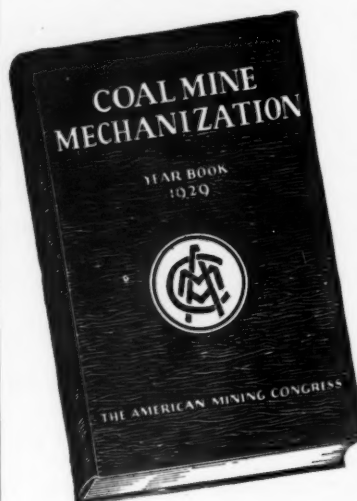
readily adapts itself to existing lines, thus enabling you to secure a permanent line by replacing inferior pipe with permanent SIMPLEX Pipe as the inferior lengths wear out. The famous SIMPLEX Joint remains bottle-tight even when the line is laid over irregular surfaces, and around curves and bends. Stock sizes: 2", 3", 4", 6", in 5-foot lengths; and 8" in 6-foot lengths.

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anization survey conducted by The American Mining Congress; it carries a brief illustrated description, impartially presented, of the loading and conveying equipment offered by the American manufacturers. There are discussions by authorities on safety, power, ventilation, and room and pillar recovery.

Reports of the survey include an outline of the latest developments in mechanical loading; descriptions of actual operations covering mechanical loading, conveyor mining and scraper mining; a study of the effect of mechanical loading on other phases of mining. These reports are comprehensive, graphically illustrated by charts and diagrams.

The Yearbook on Coal Mine Mechanization is bound in flexible fabrikoid cover and printed on high quality coated paper. \$3.00 per copy. \$2.50 each in lots of 5 or more. \$5.00 each in combination with a subscription to The Mining Congress Journal.

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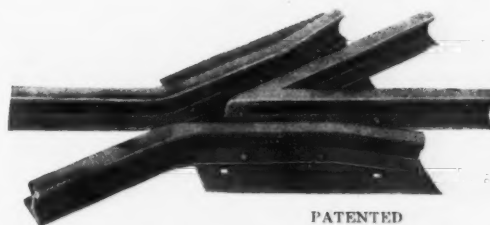
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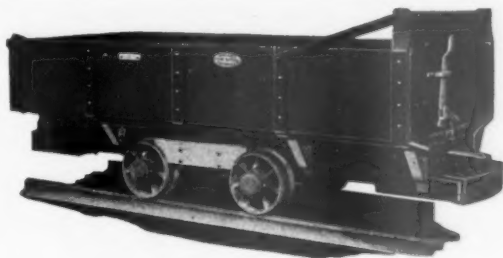
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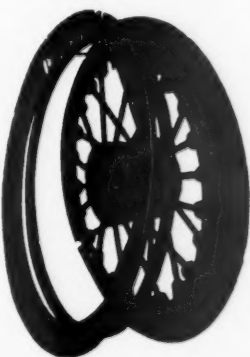
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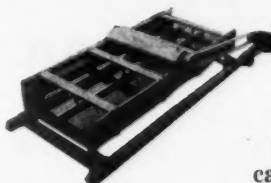


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Every inch of coal's progress from the face to the railroad cars is a factor in the profit from its marketing. Haulage must be given its full responsibility. Car capacity, draw bar pull, car stamina and lubrication costs all enter into the profits from marketing. Let us see if we can't help you some at this point.

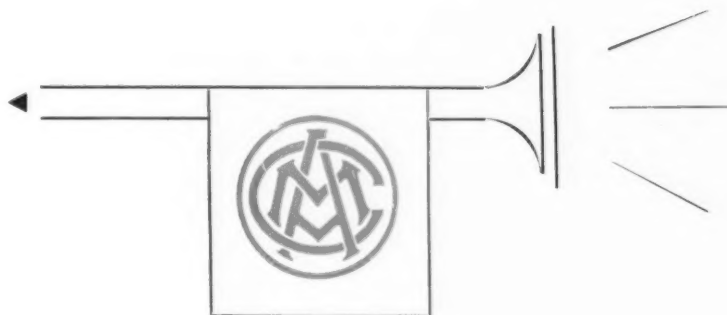


This booklet develops some of these important factors interestingly. Let us send it

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As 1931 sounds the call to progress in coal



As reveille sounds after the night of depression of 1930 it finds an alert industry. Today's battles are new and bring new problems. Radically different economic tactics are being developed for the offensive and defensive fight. New equipment for fighting coal's regular battles is offered and the use of

such equipment is increasingly imperative. Turn to pages 85 and 86 of this issue and note the program that is being developed for the Annual Coal Convention. Here are new themes and new developments of old themes of genuine consequence to profitable coal production. Note also

the notable list of men responsible for this comprehensive program. Already most of the exposition space has been contracted for. Every indication is for an unusually big, important and profitable week at Cincinnati. Plan now to be there and to send everyone from your organization who profit from the meeting.



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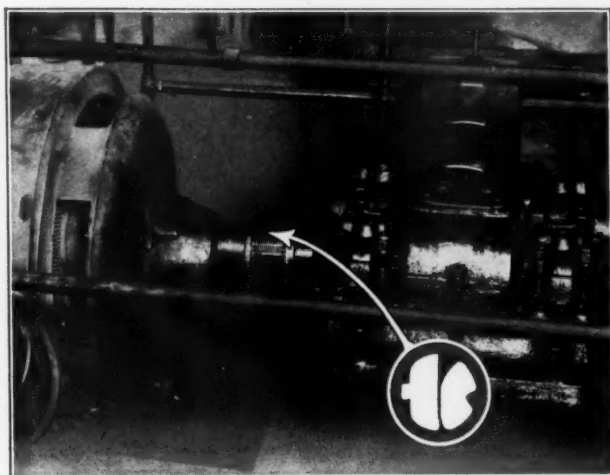
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The MINING CONGRESS'S JOURNAL

Volume 17

MARCH, 1931

No. 3

PRESENTING

The Silver Situation
The Mineral Kingdom and its Vassals

Steel Tunnel Supports
at Anaconda's Phosphate Mine
The Metal Mine—Wire Rope Problems
Safety Recommendations.

The Foreman—Manager and Teacher
Safety Organization for Large Mining Companies
Relation Between Timbering and Roof Action

Legislative Review
Industrial Development Conference

Contributors

George H. Dern, Frank H. Probert, Hugh Wright, Carl T. Hayden,
G. B. Southward, E. M. Morris, A. J. Morgan, E. H. Denny





**"We'll fight it out along this line
if it takes all summer" » » » »**

GRANT

WHEN loyal Union soldiers were falling by thousands before Lee's gallant veterans in the Wilderness of Virginia, great pressure was exerted upon Grant to give up his continued frontal attacks and return to the less costly methods of his unsuccessful predecessors in command. But history has since more than justified the bull dog tenacity with which he clung to his chosen policy.

Many coal mining officials are being similarly opposed in their efforts to establish and enforce safe operating procedures. To all such we commend Grant's unfaltering resolution—with confidence that similar tenacity of purpose in the protection of life and property will eventually be recognized and rewarded.

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THE MINING CONGRESS JOURNAL

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Practical Operating Men's Department

COAL

*The Foreman—Manager and Teacher
Safety Organization for
Large Mining Companies*

METAL

*Steel Tunnel Supports
at Anaconda's Phosphate Mine
The Metal Mine—Wire Rope Problems
Safety Report and Recommendations*

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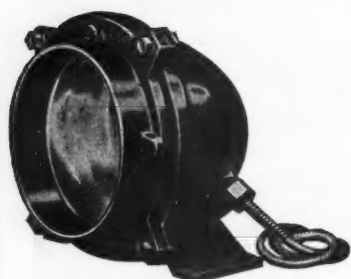


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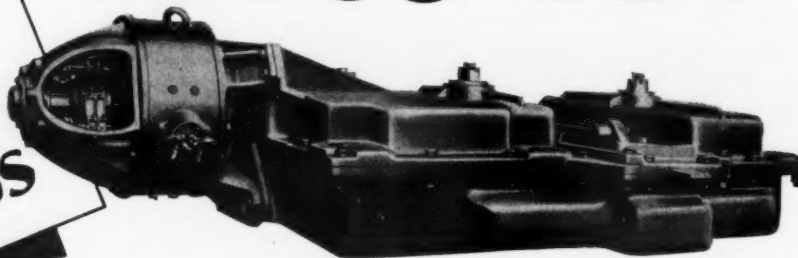
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JEFFREY COAL MINE EQUIPMENT

**PAYS FOR
ITSELF
Many Times
in
POWER
SAVINGS**

The New COSCO "C-20"



The First Shaker-Conveyor Drive
Built on an Absolutely

NOT content with its many hundreds of successful installations of the most efficient Shaker Conveyor Systems ever developed for American mining conditions, Cosco engineers have now surpassed even their own former attainments.

To do it, they had to completely revolutionize the basic principle of conveyor drives, used during the past 45 years.

For the first time, details of construction have been scientifically studied, measured, arranged and rearranged until the very maximum peak of operating efficiency was reached. Even the shape of the drive housing was radically improved to permit the compactness required for low roof and other restricted space conditions.

As a result the new COSCO "C-20" Drive, embodying these new principles, is actually 50 percent more efficient than any previous type.

In power savings alone it will pay for itself several times during its normal life.

NEW PRINCIPLE

In addition its capacity is greatly increased. Its operation is smoother and quieter. It performs superlatively on steep grades.

There was nothing ever before resembling the "C-20" Drive or which compares with it in performance or economy.

It is destined to lead for a long time because its patented features cannot be duplicated or even successfully imitated.

If you value superior performance in your mine conveyors, if you seek greater output, if you care for economy—you should at once invite COSCO engineers to discuss the adaptability for your mines of the "C-20" Drive—American designed, American built, from American materials, for American conditions.

Such an invitation will obligate you in no way.

Write for Special "C-20" Drive Circular.

Convey Your Coal
THE
COSCO
WAY

DISTRICT
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OFFICES

Frostburg, Md., 101 Maple
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igan Avenue.
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CONVEYOR SALES CO., INC.
299 Broadway, New York

The New COSCO "D-8"



Works Efficiently Where a
Bigger Drive Would be Wasteful

at ONE-FIFTH THE COST

ECONOMIC needs have brought economic measures in many fields. Why not in coal mining?

One of the most wasteful wasters in coal production is the use of high power where less power will do the work.

If a dwarf is equal to a task, why employ a giant? That is the question Cosco engineers asked themselves—and then answered it with the new "D-8" Conveyor Drive.

The "D-8" is the smallest, most compact drive made—easily portable and sturdily built to do the day's work without fuss.

It operates efficiently with a 5 to 7½ H.P. motor, but is built to withstand the strains of a 10 H.P. motor. The design, however, permits not larger than a 7½ H.P. motor to be mounted—thus providing definitely against overloading by over-

enthusiastic owners. For, after all, it's a little fellow and there is a limit to the burden it will carry.

Efficiency is its middle name—the most consistent worker at the lowest operating cost ever obtained in a drive of its size.

It is a fit running mate in every respect for the new Cosco "C-20" Drive, which has completely revolutionized previous ideas of conveyor drive performance.

The "D-8" is the ideal small space drive for conveyors feeding larger systems, or for any other work where a comparatively short line of troughing is to be used.

Cosco Conveyors are saving money for both large and small producers. Hundreds of successful installations are upholding the Cosco reputation in American mines.

Cosco Conveyors, Troughing and "Duckbill" are 100 percent American. Built in America—to American standards—by American workmen—from American materials.

Let our engineers demonstrate what Cosco can do for you in increased production, or lower cost, or both.

CONVEYOR SALES CO., INC.
299 Broadway, New York

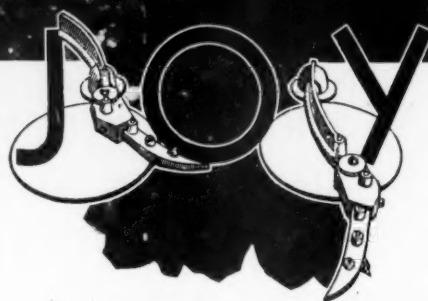
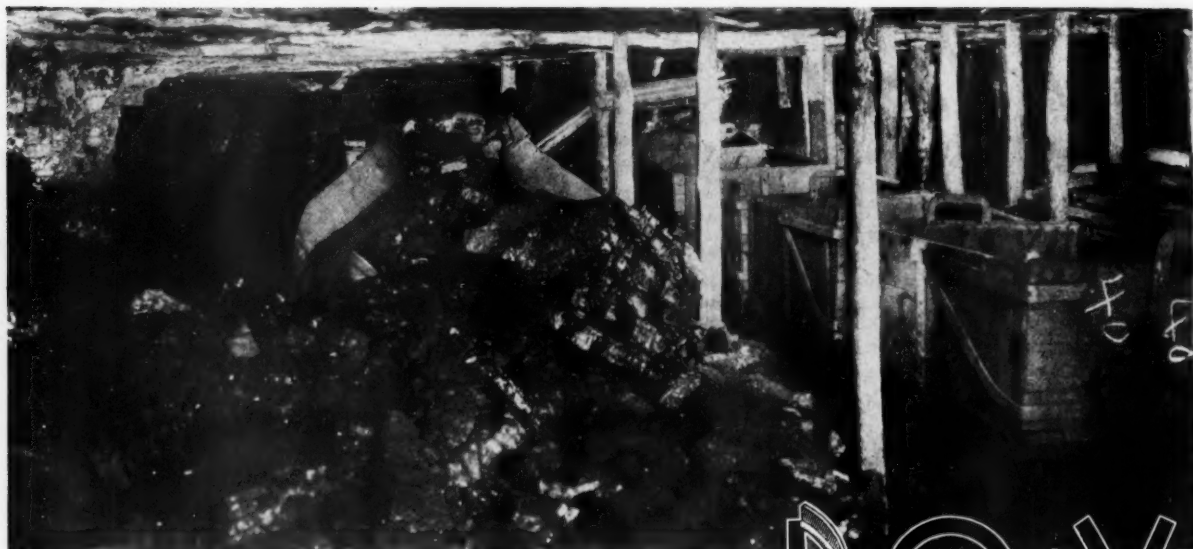


Frostburg, Md., 101 Maple Street.
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Charleston, W. Va.,
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Salt Lake City, Utah, Salt Lake Hardware Co.
Denver, Colo., Stearns Roger Mfg. Co.

Birmingham, Ala., 109 S. 21st Street.
Chicago, Ill., 224 So. Michigan Avenue.
Pittsburg, Kansas

DISTRICT
SALES
OFFICES



For the full measure of benefit from mechanization

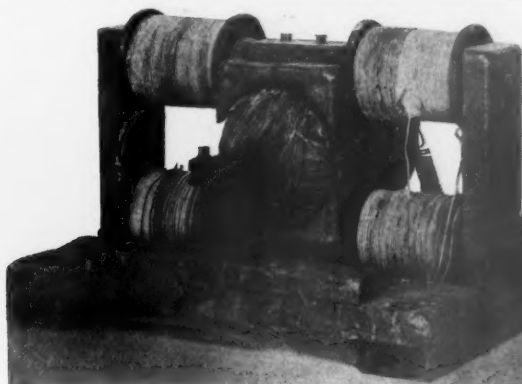
MECHANIZATION is a means to the end of cheaper coal production. In achieving this end halfway measures are of doubtful benefit; many factors contribute to its success or otherwise. None more than the type of loader chosen. Joy loaders are complete, logical and powerful machines and offer many distinct advantages. They maintain a steady stream of coal at two or more tons per minute. They operate on or off track, move rapidly from place to place, and are otherwise flexible and adaptable to differing mining conditions. One man controls all operations. 7 BUs operate in seams of from 48 to 60 inches and 5 BUs in seams over 60 inches. Send for details of operations in conditions similar to yours.

JOY MANUFACTURING COMPANY, FRANKLIN, PENNA.

NATIONAL PYRAMID BRUSHES



STANDARD FOR 40 YEARS



*Experimental, two-phase
alternating current dynamo,
built in 1878 by Elihu
Thomson.*

*Modern, hydro-electric
plant with seven, 40,000
KV-A water-wheel driven
generators.*



Progress that Never Ceases

SOUND fundamentals compose the foundation of progress. The experimental, two-phase, alternating current dynamo, built in 1878 by Elihu Thomson, looks crude but it gave material form to certain basic principles originating in the mind of a great pioneer in electrical engineering.

The first carbon brush was also crude. But it demonstrated the superiority of carbon as a brush material and National Carbon Brushes were soon playing an important part in engineering development.

Rapid progress, based on principles embodied in this early dynamo, has continued year by year. Many improvements and refinements have been introduced. Today we have huge generating stations erected throughout the country to serve the needs of our cities and our varied indus-

trial activities. The 280,000 KV-A hydro-electric plant, shown on this page, is typical of modern development. This accomplishment was made possible by the originality, initiative, courage and hard work of the pioneers in electrical engineering and of those who have followed in their footsteps.


Each new development has placed heavier demands on the brushes. The contrast between the National Pyramid Brush of today and the carbon brush of the 80's is as striking as the development of the alternating current generator illustrated above. The end is not in sight. Progress never ceases. Constant research and steady improvement in manufacturing processes give assurance of National Pyramid Brushes adapted to the requirements of any development the future may hold in store.

CARBON

Flint-hard particles of carbon, supported between highly polished carbon discs, transform the vibrations of your voice into a pulsating electric current and enable you to talk with your friend thousands of miles away. Just one of the many problems carbon has solved. It may solve yours. Let our engineers advise you.

NATIONAL CARBON COMPANY INC.

Carbon Sales Division • Cleveland, Ohio

Unit of Union Carbide  and Carbon Corporation

BRANCH SALES OFFICES: NEW YORK PITTSBURGH CHICAGO SAN FRANCISCO



FOREWARNED is FOREARMED

NINETY-NINE per cent of accident prevention is in knowing when danger exists. The miner who knows the hazards around him has a chance to take safety precautions.

But there is one hazard that does not warn him of its presence—Methane Gas. It is silent, invisible and odorless. His senses cannot tell him when methane has primed the air around him for a terrific explosion.

The U. C. C. Methane Indicating Detector forewarns the miner. Simple in operation

and light in weight, the U. C. C. Detector is carried into the atmosphere to be tested. It gives instant warning of methane, and indicates the proportion in which it is present to an extremely accurate degree. The United States Bureau of Mines has inspected and approved it as permissible equipment.

Return the coupon for a descriptive booklet. If you wish a demonstration, write or telephone the nearest District Office of The Linde Air Products Co. or E. D. Bullard Company.

Distributed by

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

186 Producing Plants



627 Warehouse Stocks

IN CANADA, DOMINION OXYGEN COMPANY, LTD., TORONTO

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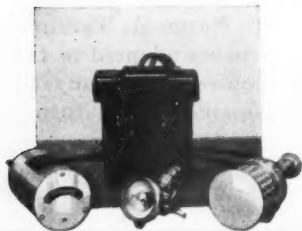
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The Linde Air Products Co., Safety Appliance Department, 30 East 42nd Street, New York
Please send me your booklet describing the U. C. C. Methane Indicating Detector.

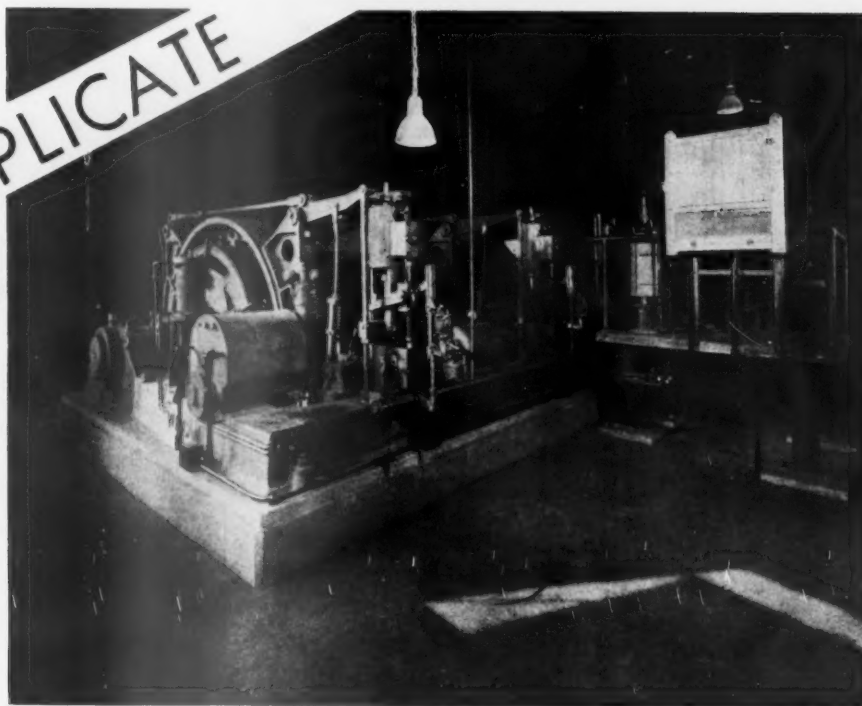
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M. C. J.-3-31.

6TH DUPLICATE
HOIST



At the world's largest anthracite mine

The experience of the world's largest anthracite mining company again proves efficiency of Vulcan equipment. Above is shown the sixth duplicate Vulcan hoist now being put into service at the mines of the Glen Alden Coal Company.

Duplication of this pivotal piece of mine equipment permits hoist operators to render their best in service and allows ready exchange of men when occasion demands. It simplifies maintenance in both labor and stock of parts. Such hoists as these have, throughout the world, established the Vulcan name as synonymous with safe and satisfactory service, combined with the best in advanced engineering practice.

The hoist shown has one cylindrical drum, 6 ft. diameter with 5 ft. face. It hauls five-car trips up a 26% grade for 3,500 ft., rope size 1 1/4 in. Weight of car and coal is 9,000 lbs. and the rope strain is 30,000 lbs. Rope speed is 1,100 F. P. M. Clutch is of the contracting band type. Two 8 ft. diameter paralleling acting post type brakes. Clutch and brake operation is by floating lever air cylinders. Motor is 600 H. P. with first motion drive, completely equipped with Vulcan safety devices.

Write for information about these or any other Vulcan equipment.

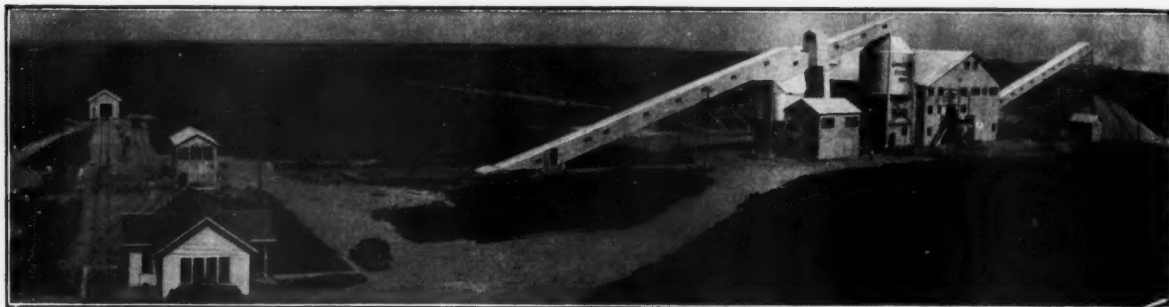
VULCAN IRON WORKS, Wilkes-Barre, Penna.

OTHER VULCAN EQUIPMENT:

Electric Locomotives
Steam Locomotives
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Corliss Engines
Mine Ventilating Fans
Cages and Skips
Sheave Wheels
Coal Crushers and Rolls
Breaker Machinery
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Open Hearth Steel Castings
Gears, Moulded and Cut Teeth
Special Machinery

VULCAN ^{of} **WILKES-BARRE**
HOISTS



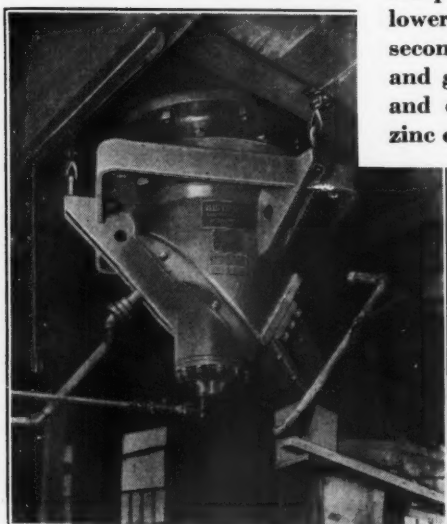


*Bird Dog Mill of Commerce
Mining & Royalty Company,
Miami, Oklahoma*

Newhouse Crushers

***lower cost of
ore reduction***

The new "Bird Dog Mill" of the Commerce Mining and Royalty Company, Miami, Oklahoma, was designed to meet present market conditions which demand the lowest possible operating cost. In designing this mill the Commerce engineers selected a 7" style "B" Newhouse crusher as having the greatest possibilities for lowering the cost of secondary crushing and grinding their very hard and extremely abrasive lead zinc ore.



Readily Accessible

In operation, this mill has exceeded its rated capacity, and the maintenance cost and power requirements for the Newhouse crusher have been low. The photographs of the crusher will indicate the simplicity of the installation and its accessibility.

A leaflet giving a complete description of the "Bird Dog Mill" and a bulletin on the style "B" Newhouse crusher will be sent on request. If you are building a new plant or modernizing an old one let an Allis-Chalmers engineer show you what this crusher will do.

ALLIS-CHALMERS

— Allis-Chalmers Manufacturing Company, Milwaukee —

**COPPER
STEEL
RESISTS
RUST!**

POPULAR *with* MINE OPERATORS



BECAUSE they're easily and quickly laid—because they're economical—because they're made of Copper Steel, therefore rust resisting—and because there are sizes and styles to suit every purpose, Carnegie Copper Steel Mine Ties receive the hearty endorsement of users.

For heavy duty service in main haulage ways, section M-27, illustrated herewith, has proved especially popular. This tie weighs 9 lbs. per foot and will accommodate rails up to 85 lbs. It can economically be substituted for wood.

For room work and for low seams of coal, there are light, shallow (but strong) Carnegie Ties with single or double locking clips riveted to the tie. Our catalogue—"Light Rails—Mine and Industrial Steel Cross Ties"—contains complete information. Copy of this book will gladly be sent at your request. Another book in which you might be interested is "Steel Mine Timber". Write for copies of these two books today.

CARNEGIE STEEL COMPANY • PITTSBURGH, PA.

Subsidiary of UNITED STATES STEEL CORPORATION

124



CARNEGIE

COPPER STEEL MINE TIES



QUALITY . . . DEPENDABILITY

Coal miners know that the coal powder which develops the most pronounced shearing action is the best coal powder.



**ATLAS Permissible Powders produce
maximum shearing action**

**12 Grades
of Coalites**

**2 Grades
of Gel-Coalites
(Water-resisting)**

Let us assist you to select the proper grade for your mine. Write nearest Branch Office.

ATLAS Powder Company, Wilmington, Delaware

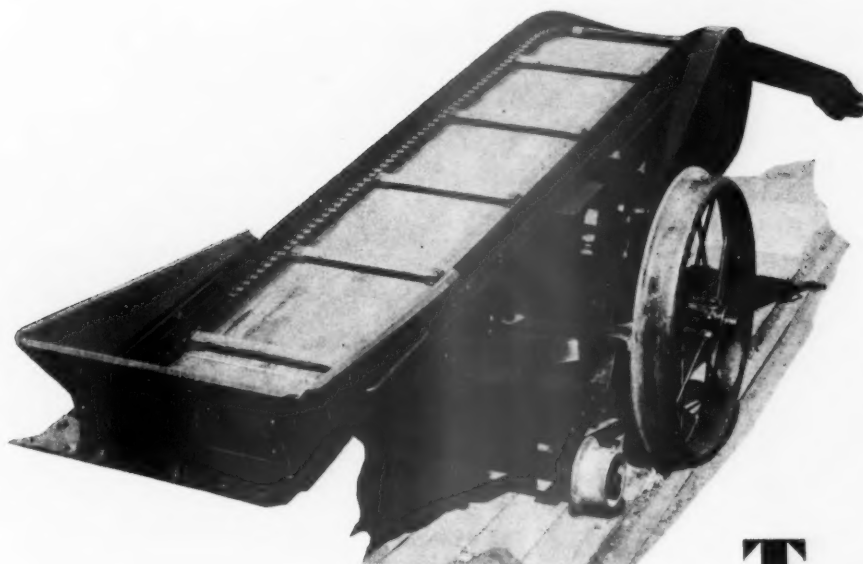
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ATLAS

EXPLOSIVES

A PROPER EXPLOSIVE FOR EVERY BLASTING REQUIREMENT

“ The loaders are the easiest moved that I have ever examined or had anything to do with ”



THE Mt. Vernon has many features that appeal to the mechanical department. The ball bearings housed and sealed in grease, the rigid frame and the flexibility in use, the simplicity of construction and control—all help to insure trouble-free, efficient service.

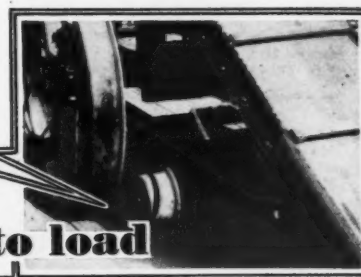
THIS same writer praised the construction and the satisfactory ability of the Mt. Vernon pit car loaders to stand up to their job, adding his belief that the roller chain and flights are the best he had ever seen placed on any machine of the kind. Such enthusiasm after heavy use proves the correctness of the simplicity and efficiency of design developed in the Mt. Vernons. These loaders are particularly easy to move from place to place, due to the folding forward pony truck. They are easily adaptable to any mining system and do not call for extensive change in supporting equipment. Let us send you photographs and sample specifications.

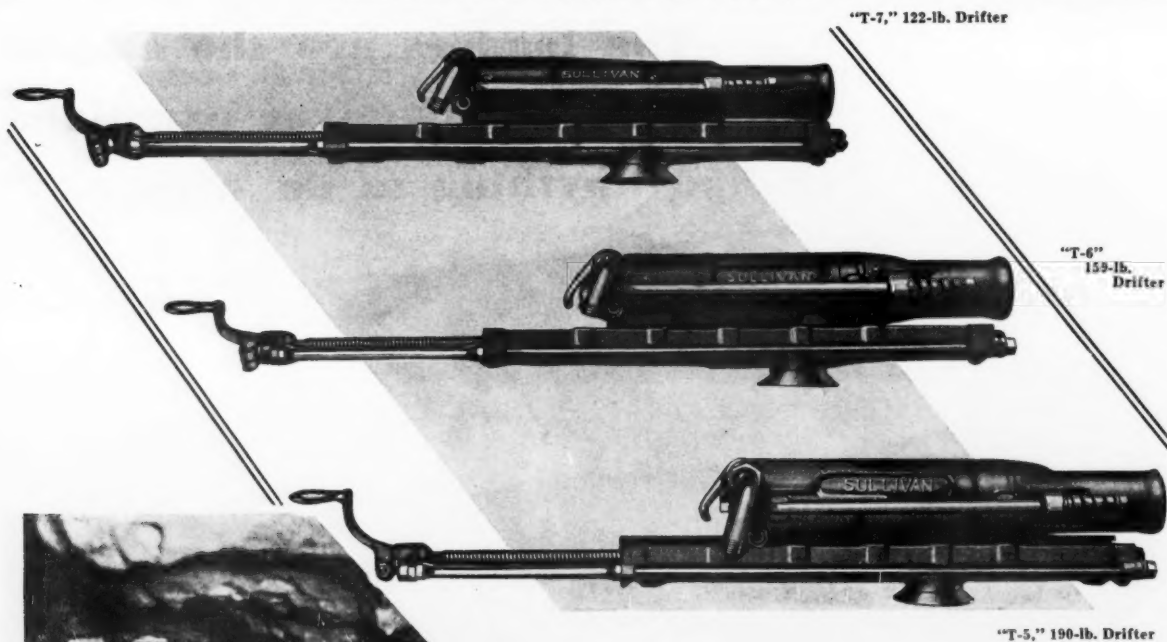
The Mt. Vernon Car Manufacturing Co.
Mount Vernon, Illinois

MT. VERNON PIT CAR LOADERS



**IN A SECOND
ready to move or ready to load**





Announcing— Faster and Cheaper Drifting During 1931—with these 3 New Sullivan Drifters—

Sullivan engineers have designed a complete new line of rock drills for tunneling and drifting work. They embody the latest field ideas and needs for runners' convenience and for drilling speed and operating economy. Note the smooth, straight barrels, free from projections to hinder roof or bottom drilling or steel handling—

The new drills are:—

"T-7" 3 inch cylinder, 122 lb. for holes to 15 feet—a one-man high speed drifter.

"T-6" 3½-inch cylinder, 159 lb. for holes to 20 feet, a substantial all-round drifter.

"T-5" 4-inch cylinder, 190 lb. a big, hard hitting tunnel drill, for the toughest rock and highest pressure you have.

Details of the new Sullivan Drifters will be found in new Bulletin 887-F. Write for your copy today.

New Drifter features include:—Rugged chuck of new pattern for 1¼-in. lugged steel.

Water inlet on side or at rear end as desired.

Perfect valve and piston motion providing cutting speed with air economy.

Effective, hand operated hole blower.

Positive rifle bar rotation.

Proved construction, based on long operation under field conditions. Some of these drills have run over 40,000 feet of hole, the equivalent of 100 ft. per day for 13 months.

Sullivan Machinery Co.,
808 Wrigley Bldg., Chicago

Mail New Drifter Bulletin to

Co.

Mr.

at (P. O.)

S U L L I V A N
TRADE MARK
SULLIVAN MACHINERY COMPANY
808 Wrigley Bldg., Chicago

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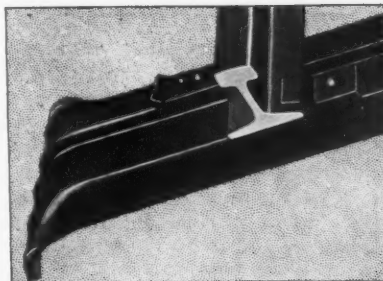
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End view of Keystone Steel Entry Tie



Where gathering locomotives haul their trips



Entry track of a large mine in West Virginia laid with Keystone Steel Entry Ties

IN ENTRIES, where gathering locomotives are constantly moving loaded trips towards main haulageways and returning with empty ones, a trip delayed by poor track means a reduction of output. Such delays may be thought negligible but because of their frequency they often aggregate heavy losses in output.

Entry track laid with Keystone Steel Entry Ties is safe and permits faster movement of trips without danger of derailment. On curves and at turnouts where the spreading of track may more easily occur, these steel ties reduce this hazard to a minimum by holding the track in alignment.

Keystone Steel Entry Ties are made of rolled steel, and are similar in structure to the Keystone No. 9 Steel Tie for main haulageways. They weigh 6 lbs. per foot and have two stationary clips and two movable clips which fit over the base and against the web of the rail. These steel ties are easily and quickly laid. They require no special tools and are readily attached to the rails. A few blows of a hammer will suffice to drive the movable clips over the base of the rail, securely locking the rail in position, true to gage.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

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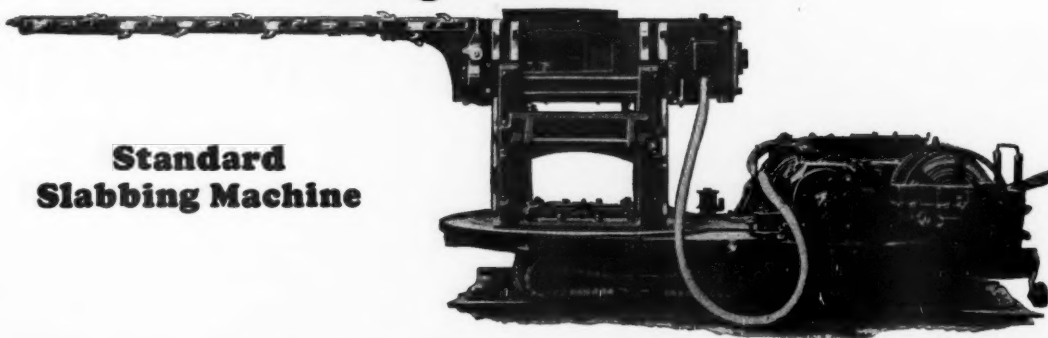
BETHLEHEM

KEYSTONE STEEL ENTRY TIE

Goodman Mounted Cutters

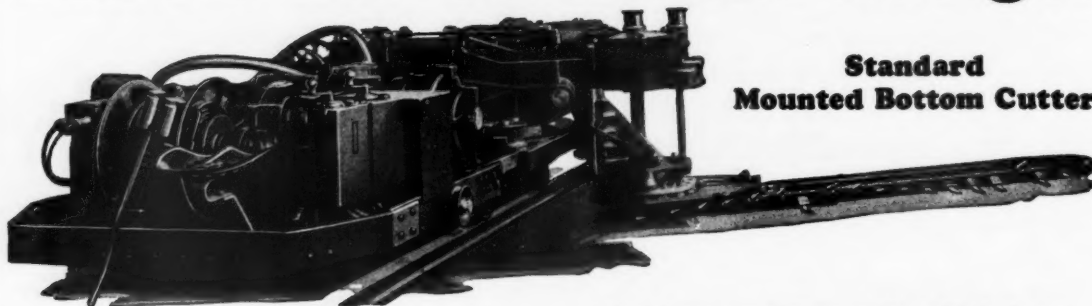
will cut at any height
from top to bottom
in high or low coal

**Standard
Slabbing Machine**



**96" ABOVE TO 8" BELOW
THE RAIL THE RAIL**

That's the Goodman Range!



**Standard
Mounted Bottom Cutter**

Features:

- Self-propelled, Self-contained Units.
- Cutterarm locked at all times.
- Cutterarm swing may be reversed instantly.
- Quickly accessible. Three Point support.
- Open, Enclosed or Gov't Permissible Construction.
- Rugged—Powerful—Safe.

Cutting and Traveling Heights:

Type of Mounted Cutter	Travel- ing Height, in.	Extreme cutting heights (Top of rail to bottom of kerf)					
		Arranged as a Top Cutter		Arranged as a Center Cutter		Bottom Cutter	
		Low, in.	High, in.	Low, in.	High, in.	Below Rail, in.	Above Rail, in.
Slabbing Machine:							
Standard	38	32	90	16	72	..	..
Low Vein	28½	23	51	14	36	..	..
Bottom Cutter:							
Standard	39	..	..	..	..	8	7½
Low Vein	30	..	..	..	..	8	5

GOODMAN

Locomotives - Loaders - Coal Cutters

**MANUFACTURING
COMPANY**
HALSTED ST. at 48TH.
CHICAGO --- ILL.

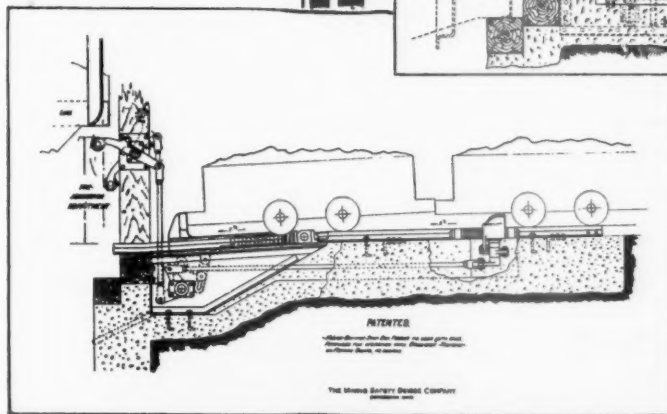
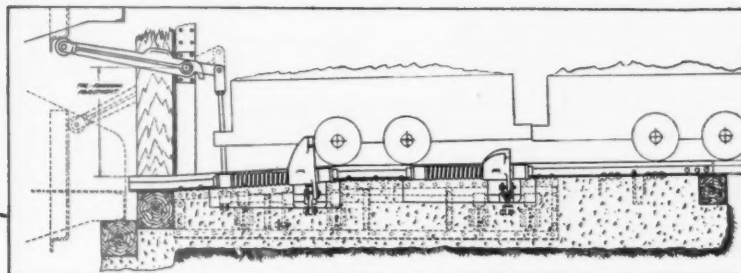
PITTSBURGH—WILKES-BARRE—HUNTINGTON, W.VA.—BIRMINGHAM—ST LOUIS—DENVER—PRICE, UTAH

(46)



NOLAN MINE CAR CAGERS offer the most successful systems of handling mine cars at Shaft Bottoms, Intermediate Levels or Top. We will inspect your mine—determine what the Cagers will save you, and send full details on a machine to suit the conditions.

HIGH-SPEED Automatic Caging



Cushioned "Bumper Stop" Type Cager

The Cager above handles all cars by the bumpers—not by the wheels. Lower car maintenance and elimination of bent axles is a direct result.

Cushioned Horn Type Cager

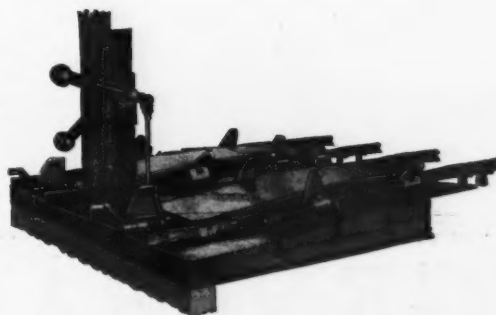
Though differing in operation and the method of engaging the car, these two Nolan Cagers have these points in common:

1. They represent the most modern and advanced car feeding practice.
2. They are fast, certain and entirely automatic in operation.
3. They are equally efficient for feeding Cage, Cross-Over, Rotary, Kick Back and Cradle Dumps.
4. Both are "preadmission" feeders and adjustable.
5. Both have made remarkable records for safe, efficient and economical operation.

These two cagers—the Nolan Bumper Stop and the Horn Type—offer additional advantages peculiar to their type. We shall be glad to discuss them in the light of their application to your problems and conditions. Write us and let us quote—we offer you guaranteed successful car handling systems of proven merit.

The Mining Safety Device Co.
Bowerston, Ohio

Manufacturers of Rotary Dumps, Cradle Dumps, Car Hauls, Mine Car Retarders, Automatic Gates, Automatic Switches, Cagers, Cage Locks and Landers, Dump Feeders, Steam, Air and Electric Car Pushers, Manual Car Stops, and Knuckle Safeties.



Nolan Automatic Double Horn Cager With Bumper Stop Safety

MIAMI'S AUTOMATIC HOIST

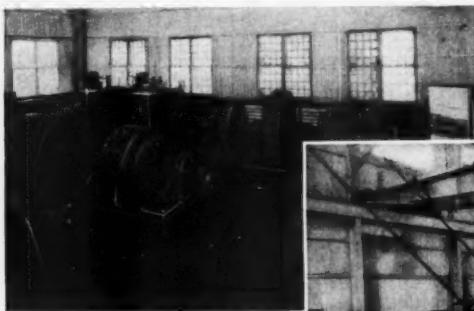
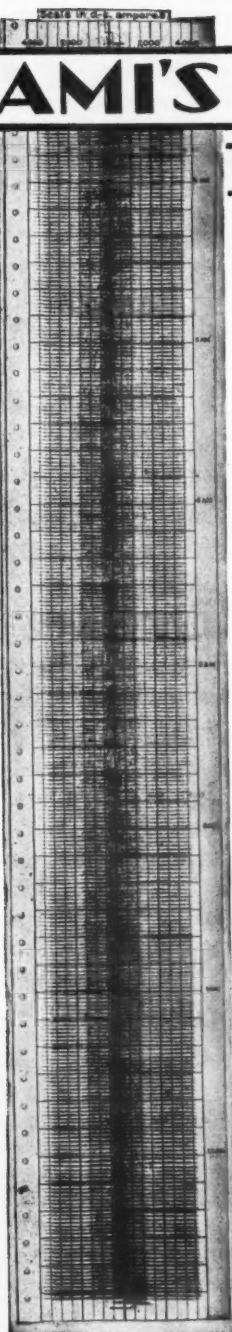
SHOWS REMARKABLE PERFORMANCE

OUT IN Miami, Arizona, the highest-speed automatic hoist in the world is boosting production for its owner, the Miami Copper Company.

Reproduced on this page is a typical metered record of the performance of this hoist during a single shift—in this particular case the "graveyard shift," between 11:00 p.m. and 7:00 a.m. During the seven hour and thirty-eight minute run so graphically illustrated, Miami's automatic hoist made 655 trips—one trip every 42 seconds—regularly, without holdups.

The regularity and evenness of this chart are primarily the result of G-E automatic control. Such regularity makes for highest efficiency of operation. The exact timing of every trip, giving the remarkably uniform current peaks shown, results in power saved—reduced costs. These combined factors have helped make possible the mining of low-grade ore at a profit.

Mining specialists in your nearest G-E office will gladly tell you more about G-E electric equipment for hoisting. Why not address them, stating your power requirements?



G-E flywheel motor-generator equipment (two duplicate sets) supplying the duplicate high-speed hoists, Miami Copper Company, Miami, Ariz.



One of two G-E 1400-hp. d-c. hoist motors geared to hoisting drums, total motor capacity 2800 hp., Miami Copper Company, Miami, Ariz.



JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

237-47

More holes to the blast.. Fewer misfires!

with these new and improved

BLASTING MACHINES

*Developed by General Motors
for du Pont, these new blasting machines
are now offered to save you money
in blasting operations!*

The NEW du Pont No. 5 Blasting Machine . . . known as the No. 5 G. M.—because it was designed by General Motors . . . has proved highly successful in many blasting operations where it is necessary to fire a large number of holes at one time.

Here are the special new features that will recommend No. 5 G. M. to you:

- (1) A two-point clutch which makes it possible to send the current out on the firing line at its peak.
- (2) A laminated armature and solid core field for building up the maximum current.
- (3) A one microfarad condenser to store up the current until the moment of discharge.
- (4) Most important of all, a new eight-point breaker of unique design which utilizes the current heretofore wasted as a large spark at the completion of the stroke.

Field windings on the new machine are so placed as to increase its efficiency. There are ball bearings on the armature shaft; and a thrust bearing for the rack bar in the direct line of the thrust instead of offset as formerly.

The new machine has a rated capacity of 100 electric blasting caps. As a matter of fact, it has often fired as many as 125 holes connected in series. The weight of this machine is a little less than 36 pounds.

In quarry and construction work, No. 5 G. M. has proved particularly useful. Its large volume of current at sufficient voltage reduces the chances of misfires from electric leakage.



A number of the features from the No. 5 G. M. machine have been incorporated in the du Pont No. 2 and No. 3 Blasting Machines. These machines are now being manufactured with a two-point clutch, an eight-point breaker switch and a condenser. These improved machines materially reduce the chances of misfires in thirty- and fifty-hole shots.

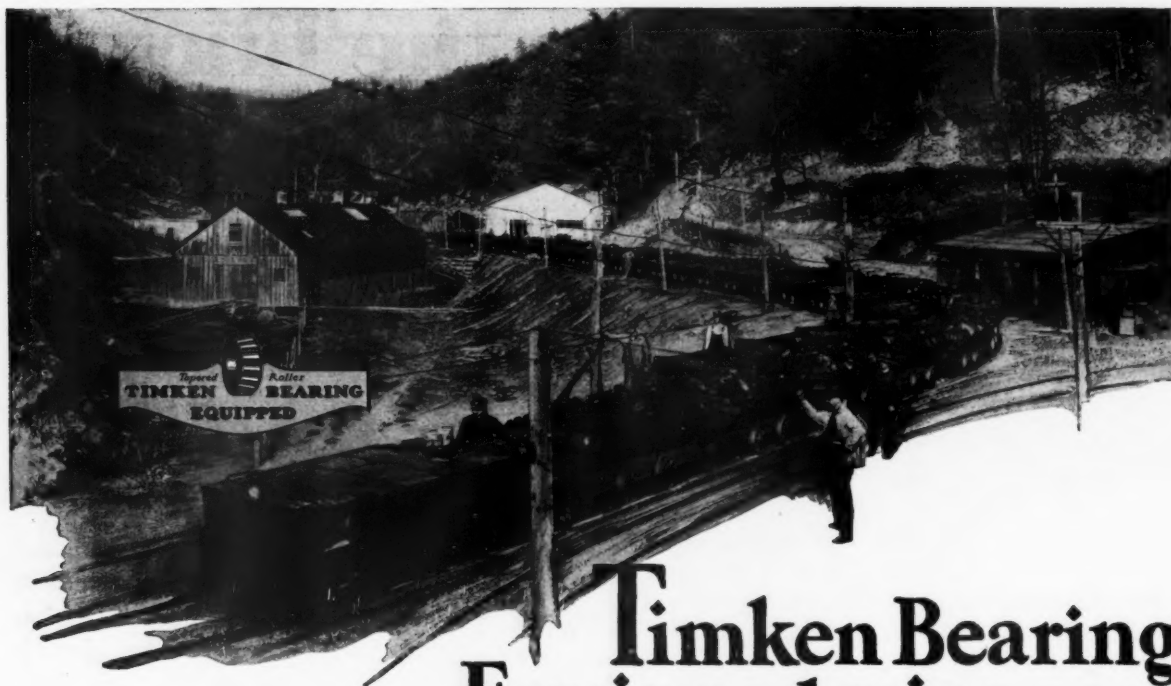
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Here is what Mr. Otto Remelin, Vice President and General Manager, writes about their Kanawha Timken-equipped cars:

"Our mine cars are subjected to very severe service and Timken Bearings loaded to capacity in the wheels of these cars are hauled about thirty miles each day at speeds

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"It is indeed a pleasure to recommend your product, and on future purchase you may feel assured that we will specify Timken Bearings without alternate". The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* BEARINGS

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Editorials

More Things Or More Leisure

BETWEEN the barter and exchange method of ancient days and the complex business transactions of the present day the gulf of separation is so great that few are able to comprehend the enormous changes which have taken place. The change from the tent on the Arabian Desert to the 85-story Empire Building, in New York, does not begin to illustrate the difference between business then and now. With all due credit to invention and new forms of transportation, there is one underlying necessity, the thread of which has twined itself through every phase of this stupendous advancement—money, the measuring rod of value—the common denominator of exchange.

For the greater part of the world's commercial history silver and gold each performed its part of this function, each was recognized as of intrinsic value. Whenever gold production has increased to some unusual volume there has been talk of demonetization of gold. When silver reached an unusual stage of production, it was demonetized by a few of the larger commercial countries. The accumulation of wealth through exchange has been so great in parts of the world that gold was particularly adapted to measure the larger wealth which had been made possible by a stable medium of exchange. But in other parts of the world where the uses of money were not understood and where the earnings power was so meager that its accumulation was seldom enough as to reach the value of the smallest gold coin, silver always has been and still is the medium of exchange, the token of value and the object of hoarding. Thus silver furnished a satisfactory medium for all local exchange and as a measure of accumulated fortune.

It was not until trade balances required satisfaction in gold that the falling price of silver keenly affected its owners. A peculiar psychology of the human mind is to quickly rid itself of any article which is falling in value. The anxiety to do this before the market price drops still farther amounts almost to a panic. The falling price of silver has staggered the confidence of half of the world's population and has affected them much as would the business public of a civilized nation be affected if it should be advised that its bank balances had by some non-understandable process been reduced by one-half.

Intrinsic Values

SILVER as a commodity never did have any large value. The same thing may be said of gold. The public mind is accustomed to think of gold having intrinsic value. This is an unmistakable

fallacy. The value of gold depends upon its acceptance by governments and by common public consent. The value of silver for many years rested upon the same basis. At a time when the business transactions of the world were but a fraction of present day operations, at a time when Great Britain was the creditor nation of the world, at a time when in public affairs might made right, at a time when civilization was emerging from the feudal system under which a few people owned most of the property and where the great majority of people were either tenants or debtors, the establishment of the single gold standard was made to serve accumulated wealth by making the debtor perform more of labor or produce more of goods with which to pay his obligation.

This control of the many by the few was based upon commercial domination and religious dictation. The Puritan established in the new world a theory of government based upon the supremacy of man, his right to develop religiously and industrially along independent lines, his success being based upon his ability to initiate, to determine and to perform. Had it not been for this newer thought in world development the condition of baron and tenant would still prevail throughout the world. Upon these principles were founded an industrial development so powerful that it was able not only to pay off the indebtedness to Great Britain but, through development of its mineral resources, its production of gold and silver, its ability and efficiency, being able to under sell in foreign markets and at the same time pay higher wages, brought into the world's vision a self-supporting nation which broke through the ancient traditions and has led the world in commercial development. The resourcefulness of this new civilization was so great that it was able to adapt itself to any condition under which others might hope to prosper, to improve every plan of past operation and through its genius to multiply its power in the world of competition. This progress has been accomplished in spite of every handicap and our productive capacity has grown to a point where it is necessary to find foreign markets in which to sell our surplus goods if we are to find continued employment for the lesser number of workmen who, through the use of machinery, are able to produce more than in the past.

The Question for Solution

VARIOUS methods are proposed to relieve this situation. The American Federation of Labor advocates a shortening of hours of service without a reduction in pay. The impossibility of this plan in general application is apparent. Ninety-five percent of the price which we pay now goes to labor. Lesser

production means higher prices and therefore less goods can be purchased by those who produce them. The labor of those who work with their hands and with their heads must elect between more leisure or more things. The unrecognized trend of our civilization has provided more things. These represent a point on the wayside between the Arab's tent and the Empire Building.

The question for solution is between fewer hours and fewer luxuries or such hours of employment as will sustain and perhaps add to the luxuries now available to those who work.

At Depression's Door

BLAME it on the depression —is America's slogan. To depression's door is laid all of the sins of individual and industry mismanagement. Among these is the human fallacy of comparing the present with the greatest periods of prosperity, a process which only adds to our misery and gains us nothing.

Dr. Julius Klein, the energetic and prolific but always interesting Assistant Secretary of Commerce, has emulated Moses and has created the Ten Commandments of Business. He offers them as ten rays of light penetrating the fog of depression. Here they are:

"Don't compare peaks with slumps.

"Don't fall into the fallacy of expecting the wage earner to bear the brunt of readjustment. Talk of drastic slashes in American living standards borders closely on lunacy.

"Don't cut loose from associated activities in business.

"Don't ignore the amazing power of the new technology.

"Don't cut marketing research.

"Don't overlook the stabilizing value of foreign markets.

"Don't fall into the perils of the mass production mania. Quantity operations are by no means assurance of quantity profits.

"Don't overlook the perils of obsolete equipment.

"Don't be stampeded by unfounded rumors."

On the whole, what Dr. Klein says is that we shouldn't be stampeded, that we shouldn't believe all that we hear, and that we should go steadily forward as best we can, utilizing the aid of all of the marvelous things that this age has placed at our disposal. It is sound advice and should be heeded.

Price Levels

THE prosperity of the United States has been unmatched by that of any other nation and that is particularly true as relating to the last fifteen years. Prosperity has everywhere, in a general way, been measured by the amount of sound money in circulation.

It has not been gold in circulation but the credit money which could be safely supported upon the gold reserve. This amount of credit is a variable factor in that it depends largely upon public confidence which may follow it beyond the point of safety and, upon the other hand, may become suspicious at any point, in which case the structure either falls or is in danger of falling.

The 1930 stock market collapse should have occurred, by every rule of the game, at least one year sooner. An earlier collapse would have been better for the country, because the fall would not have been so ruinous

for every one. Price levels throughout the country were gradually climbing until the stock market collapse awakened the public mind to the danger of continuous inflation.

While we may blame either the stock market collapse, the Mississippi flood or the drought for the halt in business prosperity, underneath all of these temporary causes lies the fact that the world's gold supply, as compared with the values which it must measure, is continually contracting. Business genius may gloss over this unrelenting cause, but its effects are none the less certain. The United States has more than its share of the world's gold supply and, therefore, did not feel this unerring trend like other countries. Had it not been for contracting markets abroad, the business depression here might have been postponed to a much later date.

Silver In World Commerce

A FULL consideration of silver's problems as related to world trade is requested by Senate Resolution No. 442, introduced by Senator Pittman, which, after a statement of present world conditions, recommends as follows:

"Therefore, the Senate submits to the President these findings of fact, together with reports, hearings and other data in respect thereto, with the respectful request that he shall, if he deem it compatible with the best interests of the Government, enter into discussion or negotiation with the governments for India, Great Britain, France, Belgium and other governments, looking to the suspension of the policy and practice of governments melting up or debasing silver coins and sales by governments of silver, and that he take such other and further action in the premises as he may deem necessary to eliminate the abnormal fluctuations and depressions in the price of silver.

"The Senate further suggests that the President, if he deem it compatible with the best interests of the Government, call or obtain an international conference, or international conferences, to the end that agreements or understandings may be obtained with respect to the uses and status of silver as money."

The Price for Public Service

WE have at times expressed ourselves somewhat heatedly upon the growing tendency in the Senate to publicly chasten and penalize those whom the President has chosen as his leaders in his administration of our government. We took particular exception to the fact that humiliation and embarrassment were heaped upon the distinguished head of Charles Evans Hughes before he was confirmed to the Supreme Court of our land.

Recently, the Senate confirmed the appointment of Eugene Meyer to be governor of the Federal Reserve Board, by a vote of 72 to 11. There was, of course, never any doubt that Mr. Meyer would be confirmed, as there was never any doubt that Mr. Hughes would be confirmed. Nevertheless, both Mr. Meyer and Mr. Hughes were subjected by a few Senators to a third degree and were forced into the uncomfortable position of listening to baseless rumors, unfounded accusations and insulting questions. Be it said, however, to their everlasting credit, that they came through the ordeal with enhanced reputation.

The price for rendering public service is rapidly becoming such that men of the calibre that we have so far obtained will hesitate before accepting an invitation of a President to become a factor in our government. So far, we have been fortunate in obtaining the services of the highest type of men in our public service, in spite of the mud-baths to which they are subjected. Most of

our Senators are above such mud-slinging tactics, as evidenced by the vote above referred to, but, unfortunately, there will always be a few who will take full advantage of their senatorial immunity to flood the country with, in the main, baseless accusations.

Public service offers small enough reward. Add to it the certainty of willful persecution and men will refuse to subject themselves to it. We need big men, great men, in our country's management, and every means should be devised to keep them.

Mr. Hughes on Bureaucracy

THE regulation of great business enterprises has been a cause of concern for many generations. As business has grown, the problem has become more and more complicated until today the maze of committees and commissions regulating business is bewildering. That the commission is the necessary outgrowth of expanding enterprises does not mitigate the necessity for complaining about it. With the creation of commissions there has developed its corollary, the bureaucrat and the bureaucratic viewpoint. Could anything else be expected? When a man remains at the head of a department or a commission for many years, presenting the side of government, can he be expected to have other than a bureaucratic view? And is there anything so terrible in that fact? Is such a view any different than a capitalistic viewpoint, or a labor viewpoint, or an industry viewpoint? Is one more unselfish than the other?

Taken abstractly, the answer is no. But in Washington the atmosphere is frequently chaotic, with divergent opinions. Chief Justice Hughes, in a recent address to the Federal Bar of Washington, said: "To some you may appear to be the living symbols of bureaucracy . . . but if you are true to the standards of your profession, you may well turn out to be the protectors of society from bureaucratic excesses."

There perhaps we have the crux of the situation; "bureaucratic excesses" is the thing to fight against, not the bureau itself. Frequently a great corporation, guilty of the crime of wealth, succeeds in recovering controverted items in its tax returns, improperly collected. It is at once the target of those who believe that the government makes no mistakes. The Revenue Department is a hot bed of controversy. Industry as a whole wishes to pay just taxes; the government as a whole wishes to impose just taxes. But there is a wide divergence between wishes and performances. In spite of the fairness of the Revenue Department, it is said that 40 percent of all the cases before the Supreme Court come from this department.

The proposals to place the government in business in competition with private enterprise are daily occurrence. They parallel the cries of those outraged by the present government competition and supervision of business. The war continues between the bureau and the industry, between those who make government possible and those who administer that government. So far, industry has a little the edge in the fray. But the bureaucrat is not to be ignored. He is here with us to stay. The bureau and commission form of government is our system. It is not the bureau that is the cause of the difficulties. It is "bureaucratic excesses" that make us writhe.

Taxation and Competition

THE staff of the Congressional Committee on Internal Revenue Taxation is working on a further report on the subject of depletion. The

result of the findings of the staff will inevitably be of importance to the coal industry, regardless of the fact that the coal people did not furnish information to the committee at the recent hearings. The case of coal has not been presented for consideration and such thought as the staff may give to the federal tax interest of that industry must be based on information developed in the past and from such data as may be requisitioned from the treasury department. At the time of issuance of the "Preliminary Report on Depletion" the attitude of the committee staff toward coal may be drawn from the following:

"The coal industry has been profitable only in a few years and is now in a condition as depressed as agriculture. The present system results in taking away from the bituminous coal industry a large proportion of its profits in taxes in the infrequent years of prosperity. It appears, therefore, that a substitute method is desirable."

In 1920, "the infrequent year of prosperity," the coal industry paid a federal income tax of \$107,000,000 and ever since that year has been depleting its resource in coal lands through production and through selective mining wastage in production. This resource in coal areas is the industry's capital and because of the ruinous market condition it has not been restored through depletion, but has been wasted.

Today, more than ever before, fuel oil and natural gas are the serious competitors of coal. In 1927 fuel oil and natural gas were consumed in the equivalent of 320,000,000 tons of bituminous coal. Coal should, as a competitive fuel and a product of an admittedly distressed and vitally important industry, receive the same consideration in the return of capital through depletion as is proven to be equitable for natural gas and oil. Coal mining and metal mining are not competitive. Coal mining, natural gas and petroleum are inextricably competitive and should be considered apart from the other natural resources.

Deport all Criminal Aliens

THE request of President Hoover to Congress for an increased appropriation of \$500,000, for the purpose of carrying on more effectively the process of deportation of aliens within this country who are disturbers of our peace and who are striving to break down our theory of government, should command attention and sympathy.

This work can not go on too rapidly. Every American citizen has a right, in fact it is his duty, to protect and defend the government under the Constitution, and every alien who attempts, or who sympathizes with attempts, to break down our form of government is an enemy to this country and should be treated as such.

Russia is an expansive country. There is ample room there for all those who believe in its form of government. Those of our own citizens who believe that any foreign country has a better government than our own are privileged to depart.

This is no argument against free speech. A proper criticism of any functions of our government or any of its officials is within the right of every citizen, providing that those efforts to effect a proper change are carried on by the methods authorized by the Constitution for effecting such change. All efforts toward changing our form of government under the provisions of the Constitution are within the rights of every citizen. Every

effort to effect a change by any different method is treason against our government and should be so treated.

A Cheerful Good-bye

AS we go to press we have every assurance that a special session of Congress will not be necessary. The supply bills are out of the way, the drought relief legislation has been cared for, and the soldiers' bonus is passed over presidential veto. Even Muscle Shoals has received its consideration.

With the rest of the country we draw a sigh of relief. The press, expressing the wishes of the community, has made it quite clear that we have had enough of Congress for this year. There has been no mistaking the feelings of the country in this regard.

There is a vast difference between healthy discontent, because of a condition, and the fervent belief of the minority that whatever is, is wrong. And that "fervent minority" has kept the present session of Congress in a turmoil. It has insisted that the reasons back of the obvious desire of the country for Congress to go home were inspired by "predatory profiteering and reactionary private interests." Or, if not by them, then surely by party-politics which are "self-seeking" and which wish to keep dark the mistakes of the administration.

But whatever the reason, the country is going to be better satisfied with Congressmen away from Washington. Business will not have continuously held over its head the threat of unwise legislation. And, since Congress has been in almost continuous session for many, many months, surely it has had sufficient time to consider and present all its pet projects.

The fact that Congress is unpopular is no secret. The great swing of public sentiment is undeniably toward the President and against a Congress that has made existence unbearable for him. That Congress recognizes this fact is evidenced by the speed with which it responded to the will of the folks back home, and it is ample evidence that the "folks back home" can, will and do control our national legislature when they really wish to.

Modern Coal Mine Management

WHAT constitutes the modern mine? Certainly machinery alone cannot solve the problem of efficient production. More than mere mechanical perfection is required for successful operation. Personnel training and man direction; a budget system of control; closer coordination and balancing of the various operating phases of mining; higher productive efficiency from the machinery used, and the intelligent adoption and maintaining of some method of safety.

All of these things go into the development and maintenance of the modern mine. All of these things must be given serious consideration if any mine is to stay in operation today in the highly developed and competitive markets for the product.

If any coal man is interested in learning how others in the industry have successfully met these problems, if he is interested in learning first-hand what others have tried and found wanting, if he is interested in keeping abreast of coal production methods, with efficiency and safety, he will make it a point to be at the meeting of The American Mining Congress, Music Hall, Cincinnati, Ohio, May 11 to 15. He will come prepared to give and to get. Prepared to see and absorb. For the program which has been arranged promises a veritable

bonanza of information, and the exposition which will be presented will furnish an actual demonstration of how the industry is reaching a high state of efficiency.

There is one week in the year that coal men do not forget. It is the week that the industry looks forward to. It is the week that furnishes the climax to weeks of preparation in an effort to present an annual log of coal mine progress. The 1931 Convention and Exposition promises a great treat. Modern Coal Mine Management is the theme of the program, which is being developed by the operators themselves.

The 1930 Record

RECENTLY the secretary of the Manufacturers Division of the American Mining Congress gave out a statement analyzing the results of the 1930 convention and exposition held under its auspices at Cincinnati. It says:

The 1930 convention and exposition, held last May, furnished some excellent information as to the type of men attending. For instance, there were 505 companies represented. In this group were 74 companies whose annual production averaged from one to twelve million tons each. These 74 companies sent 429 operating officials, and in 1929 the group of 74 produced 236,041,465 tons of coal.

Thirty-five companies of this group, whose production totaled 24,737,000 tons and who produce from 500,000 to a million tons annually, sent 107 operating officials.

The remaining 398 companies making up the 505 represented, with average annual production of from 50,000 to 500,000 tons each and representing a total production of 113,332,705 tons, sent 964 operating men.

Further analysis of the registration list shows that 18 States and several foreign countries were represented. The companies sending representatives operate 1,216 mines.

These 1,216 mines, as represented, are particularly interesting because of the fact that according to the United States Bureau of Mines 1,809 mines produced 90 percent of the coal produced in 1929. This would indicate that we are reaching, through this convention, an amazing percentage of the total coal produced.

This is an enviable record and shows conclusively the very real interest the industry has in this convention.

Power

THE coal industry, while notoriously the incorrigible of our industrial family, is nevertheless the great hope of this country as the source of cheap power. It is axiomatic that the preeminence of the United States in world affairs is largely dependent upon the development of low-cost power and its widespread use in home and farm, factory, mine and mill.

The coal industry is at all times endeavoring to reduce its production costs, to furnish even cheaper power fuel. Great strides have been made in the past year in the use of pulverized coal, and it is not improbable that the near future may see coal in pulverized form, conducted from mine to central stations through pipe lines.

Competition with oil and gas is forcing coal to make rapid strides, and we may expect some intensely interesting results within the comparatively near future.

The SILVER SITUATION



By George H. Dern*

Governor of Utah

A FEW days ago, as I was looking through some literature on the silver question, I ran across this sentence: "As is usual, a lot of balderdash is appearing in the financial press in the shape of contributions by those who obviously possess no expert knowledge of most of the finer points involved."

My immediate impulse was to revoke my promise to address this meeting on the silver question, for I frankly disclaim any expert knowledge of the subject in general, and certainly not of the finer points involved. It is only the fear that a broken promise might be rated as a deeper sin than a mediocre performance that I concluded not to cancel this engagement.

I do not know much about Einstein's theory of relativity, but if it is any more abstruse and difficult of comprehension by the ordinary or garden variety of mind than is the present silver situation, I prefer to devote my intellectual exertions to problems that properly fall within the purview of my own official field rather than rush in where Senators, Congressmen, and Cabinet officers fear to tread.

I approach my task, therefore, with diffidence, and I begin with the assurance that I have no panacea to present, nor any original ideas to promulgate. Indeed, I prefer to choose as my topic the silver situation rather than the silver question. To discuss a question inferentially means an attempt to solve the question.

This meeting is being held in the leading silver-producing State of the Union, and the calamitous decline in the price of silver has been particularly disastrous to us in Utah, as it has been to other mining States. I recognize, however, that a number of commodities have declined as sharply in price as has the white metal. It would therefore be futile to discuss this subject from the stand-

point of relief for the silver-producing states. Eastern members of Congress, appreciating our plight, might, as Senator Pittman said, cry with us, but they would not vote with us.

The most that I feel warranted in doing is to ask you economists to consider whether or not the depression which now grips our country as well as the rest of the world may not in part be due to the fall in the price of silver. If action in behalf of silver may be expected to benefit the entire nation, then we shall be justified in the hope that an enlightened self-interest may eventually demand a national and international policy that would amount to doing something for silver.

IF a higher price of silver would stimulate industrial production in the United States, and thereby start up idle factories and put an end to unemployment, obviously industrialists and workers alike would clamor for action that would raise the price of silver.

If a higher price for silver would raise the price of wheat, corn, and cotton, of course all the farmers would be for it.

If a higher price for silver would increase our exports to Canada, Mexico, Japan, China, and India, and thereby help dispose of the surpluses of agricultural and manufactured products, everybody would be for it.

A good many careful students of the problem are of the opinion that all these things might happen if the price of silver were raised. I take this opportunity to present their viewpoint for your consideration and analysis. I confess that I personally am not convinced that the present world depression could be cured by merely raising the price of silver. It seems to me this would be equivalent to holding that the whole depression was caused by the drop in silver, which surely would be a risky statement. And yet it may well be that the drop in silver has been a factor which has contributed to the depression.

WE all know that only a little more than a year ago industry was booming, commerce was thriving, unemployment was negligible, and the country, with the exception of agriculture, was prosperous. Today prosperity has vanished; millions of men are idle; factories are shut down or running part time for want of markets, and commodity prices have shrunk severely.

What caused this cataclysmic industrial slump? The usual answer is overproduction. We are told that there had been an over-expansion of the productive capacity of our industries, largely on account of mechanization; that by means of a high wage level, high pressure salesmanship and installment buying the excess production was absorbed for a while; that finally the market became saturated and surplus stocks piled up; that it became necessary to curtail production until consumption could catch up; and that this curtailment produced the unemployment and hard times which now plague us all.

This explanation is not wholly satisfactory, because it is not true that the market has been saturated. There are millions of people in the United States this winter who are underfed and undernourished, while in China gaunt famine has been stalking through the land; and at the same time the Government of the United States has bought and stored and taken off the market over 100,000,000 bushels of wheat in an effort to stabilize the price for the farmer. These same millions of people are scantily clothed, and yet there are vast stocks of cotton and wool which are drugs on the market. There exists a similar need of and desire for manufactured goods, with the same lack of buying power.

The inevitable conclusion is that it is not overproduction that we are suffering from, but underconsumption, due to lack of ability to purchase. Then the question becomes, What is the cause of this underconsumption? Where did it start?

WE have two kinds of consumption: Domestic and foreign. Our domestic market consumes the great bulk

* Address before the Pacific Coast Economic Association, Salt Lake City, Utah, December 29, 1930.

of our products, but in many lines we produce more than we can consume, and we look to our foreign trade to absorb the surplus. This is notably true of such important items as wheat, cotton, copper, and automobiles. I suppose it is still an accepted principle of political economy that, unless artificially controlled, the price of the exportable surplus determines the price at home. Even though the exportable surplus be a small percentage of the total production it may spell either prosperity or adversity for an industry.

The markets of the world have normally taken our surplus products, but for the past year or two they have failed to do so. The demand has fallen off, and the surplus has been thrown back upon us, with consequent glutting of home markets and demoralization of prices.

It appears that the chief cause of decreased foreign consumption of our products is reduced buying power of our former customers. They have not turned to other sources of supply—they are buying less or are not buying at all.

Our oriental trade in 1929 had developed into a two-billion-dollar enterprise. In the first five months of this year there was a drop of more than \$70,000,000 in our exports to Asia. India's imports were \$83,000,000 in January and \$45,000,000 in July. The slump in China was even greater. In these two countries decreased purchasing power has been most marked, and it is noteworthy that these two countries are the largest silver users in the world. They consumed over 70 percent of the world production of silver in 1928.

SINCE January, 1929, the price of silver has dropped from 57 cents per ounce to 31 cents, or a 45 percent decline. In point of time, the drop in silver coincides with the slump in our oriental trade. There seems to be no doubt that low silver has crippled the buying power of India and China, and is therefore largely responsible for the falling off in our commerce with Asia.

In October President Hoover, addressing the American Bankers' Association, said: "The buying power of India and China, dependent upon the price of silver, has been affected."

Thomas W. Lamont, of J. P. Morgan & Co., has said that one of the chief causes of world depression is "the scarcity of gold and the depressed price of silver."

Another eminent financial authority, Julius H. Barnes, chairman of President Hoover's National Business Survey Conference, said in an article that "a price of silver which fluctuated from \$1.45 some few years ago to 35 cents today and yet symbolizes the credit and re-

sources of great peoples, could not but harm the business structure of the world."

Other economists, financiers, and statesmen have made similar statements, which indicates that the renewed consideration of the silver question emanates from respectable and conservative sources, authorities who would be the last to make a suggestion that would be out of line with sound financial policies. It is therefore not necessary to shy away from an investigation of the silver question on account of a fear that it involves an attack upon the gold standard. Since India and China are the chief consumers of silver, and since the drop in silver has been simultaneous with the slump in our trade with these oriental countries, it is pertinent to inquire what has happened there that might account for the two coincident phenomena.

IT is estimated that India has \$5,000,000,000 of metallic wealth, possibly about evenly divided between gold and silver. According to the Bliss report, this \$5,000,000,000 keeps India poor, because the people hoard the precious metals in the form of temple decorations, jeweled ornaments, bars of bullion, bangles, bracelets, anklets, necklaces, and American "eagles." The result is that all this metal becomes "frozen wealth," because it yields its owners no return, nor does it form the basis of a dollar of credit to carry on the commerce of the nation and the world.

This wealth is scattered among millions of unorganized holders, and even the silver coins which constitute the metallic currency are snatched into private hoards by the ryots or peasant farmers. It is alleged that this problem of hoarding is at the root of the pathetic plight of millions of these farmers. Hereditary custom, social organization, seasonal harvests, and the still primitive financial system all influence them to assemble any wealth they have in a readily portable form and often to hide it.

In old days of tyranny and oppression, manifest prosperity was an invitation to be stripped of one's possessions. Hostile invasions also forced great southward migrations of people who, to save their wealth, had to collect it in a highly concentrated form. These conditions have left their influences to this very day.

The Hindu family, moreover, ordinarily holds all real property and household goods in common. The individual wishing to save for his own use can segregate his savings only in the form of gold and silver. Millions of the native population, too, have no access to banks. In time of stress they must draw on accumulated reserves, which act consists perhaps of taking a silver bead

out of the wife's necklace. The ordinary man is too poor to acquire pieces of gold large enough for such beads, and therefore silver is the metal with which he bedecks his wife and makes her his savings bank.

It may be presumed that the British Government, deeming this condition a detriment to India, sought to remedy it. The remedy proposed by Mr. Bliss was the adoption of gold bullion as a basis for India's currency; replacement of silver rupees in circulation with gold notes; a strong central bank; and extension of savings bank facilities.

"In 1926, a Royal Commission on India's monetary system," writes Francis H. Brownell, "recommended that India go to a gold exchange standard and gradually sell on the open market the excess stocks of silver, consisting of several hundred million ounces then owned by the Indian Government. At the time of the publication of that report in the summer of 1926, silver was selling at about 65 cents per ounce. A rapid fall in the price followed, and in December of the same year the price averaged less than 53½ cents. From this level it recovered somewhat, averaging 56.37 cents for 1927 and 58.18 cents for 1928." In 1929 it averaged 52.99 cents, and by December of that year it had sagged to 48 cents. In January, 1930, the price was 45 cents, and in this present month of December it got down to about 31 cents. Silver is now far cheaper than ever before in the history of the world.

In China, too, silver is practically the only metallic money, as well as a means of hoarding. Most orientals use silver as a medium of exchange almost to the exclusion of gold. China has been in a state of civil warfare for several years, in consequence of which the silver of the country has been drifting to Shanghai for safety, and the demand has fallen off.

EARLY in 1930 the Indian Government placed an import duty on silver of between 9 and 10 cents per ounce, which had a depressing effect on the world price. Silver fell 15 cents an ounce last spring, with the result that exchanges, especially of China and Mexico, became sadly demoralized. For an article that we sold in China for \$1 in Chinese money in 1925, we are now asking \$2 in their currency. In the eyes of the Chinaman we have doubled our prices, and he refuses to submit to what he considers our exorbitant demands. As a matter of fact, we are as much victims of the situation as he is. We do not get any more for our article, whilst he has to pay double the former price on account of the unfavorable exchange due to low silver. However, he does not understand that we do not profit by the increased price, so he thinks we are un-

fair, refuses to buy, and we lose the business. In other words the buying power of his silver money has been cut in two, and our market has been destroyed.

China and India together have 720,000,000 people, or about half the population of the world. These people, not to mention Mexico and many other smaller countries, including most of South America, are silver users. Silver is their primary money metal. They do not use banks, for their individual savings are usually too small to be profitably handled by banks. They require large amounts of metal for their savings, which means hoarding. When the farmers are in funds from the sale of their crops they are in position to invest in silver for hoarding purposes. Gold does not answer the purpose, because it is insufficient in quantity and because it does not lend itself to cutting up into small amounts. The oriental may save only the equivalent of 50 cents* or \$1 over a considerable period of time, and gold coins of such value would be too tiny to be practicable.

Notwithstanding the efforts to put India on a gold standard, and similar suggestions for China, the people of those countries will not abandon their traditional hoarding habits for a generation or more. They have for ages been accustomed to invest their savings in silver, as a result of which there is an enormous quantity of silver in the hands of oriental people, probably more than 7,000,000,000 ounces.

If the value of all this silver has been suddenly cut in two, does it not look as if the purchasing power of half the population of the world had thereby also been cut in two? Could the value of all the gold in the world be reduced 50 percent without world-wide consequences? As a matter of fact is not the very depression which has now paralyzed the world due to an increase in the real value of gold, measured by its purchasing power? If it takes two bushels of wheat to buy a gold dollar where formerly it took only one, has not the farmer been adversely affected by the advance in the real value of gold? Conversely, if gold had gone down in value, so that it would take more of it to buy the necessities of life, would it not adversely affect the wage earner? I mention these elementary examples merely to emphasize the suggestion that violent fluctuations in money metals are bound to have far reaching effects. Is it any wonder that there is revolution in India and civil war in China?

It seems obvious that the purchasing power of China, India, Mexico, Central America, South America and several European countries has been cut in two if not practically annihilated by the drop in silver. This has made credit transac-



Sunset on the Great Salt Lake

tions with these silver using countries practically impossible, and, of course, without credit there can be only a very limited commerce. I ask again, does it not look as if the decline in the silver market might logically be cited as a prime cause of world depression? Can such a financial upset occur without upsetting world commerce, and particularly our own prosperity? Some responsible students of the problem have made the assertion that the drop in silver has been more largely responsible for the world-wide business depression than any other single factor.

WHAT can be done about it?

Senator Pittman says: "The immediate remedy for this cause of world depression is simple. Let the powers of the world, led by the United States, persuade the British Government for India to desist from such destructive policy (the dumping of silver), and silver will undoubtedly be restored to its normal price of around 64 cents an ounce. Let it be remembered, he adds, that 64 cents an ounce is not an exchange ratio of 16 to 1, but represents a value of about one-thirty-second that of gold, or 32 to 1. It is not even the exchange price for silver coins in the United States or in any other country using silver coins."

Senator King proposes an international conference to negotiate an agreement for the stabilization of silver as to its exchange value with gold, and Senator Pittman accepts this as a part of a constructive program. He says, "I am firmly convinced that trade and commerce would be facilitated and economic conditions throughout the world greatly relieved if there could be an agreement between governments as to the price at which silver should be exchanged for

gold. This would not injure the gold standard nor deprive it of its character as the base for money."

He continues, "The stabilization of the price of silver through the agreement of nations as to its exchange value with gold would not be difficult of accomplishment. If governments should agree not to melt up or debase their money silver, then the quantity of silver that would have to be considered in the stabilization plan would be quite small. In other words, only annual mine production would be a factor to be considered."

Mr. Brownell fears that an international conference at this stage would not be of benefit. He thinks the political situation in India is most delicate, and that now is not a time when the question can be considered with any prospect of concrete action by way of legislation. However, the cotton manufacturers of Manchester are complaining to the British Government that its policy in India has destroyed their export trade, and has caused widespread unemployment in England. Under these circumstances the British Government might not be unapproachable on the subject.

Mr. Brownell makes several suggestions. The first is that India and all European or other governments might cease the further sale of silver, retain in their treasuries what they now hold, and publicly announce such a policy. He says a consideration of the amount of silver purchased annually by India and China indicates that, with the cessation of sales by governments, the new mine production of silver would probably be fairly easily absorbed. This suggestion is substantially the same as Senator Pittman's.

Mr. Brownell's second suggestion is that the use of (Continued on page 138)

The Mineral Kingdom and its Vassals

By Frank H. Probert



THIRTY years ago I was engaged in an examination of the Rio Tinto mines of southern Spain. My companion and employer on that mission was Dr. James Douglas, then president of Phelps Dodge and Company. In our nocturnal peregrinations—the day being fully occupied with an intensive study of technological problems—he would frequently speak of a distant land beyond the frontiers of my geographical knowledge, Arizona, where mining was active but where a mineral empire awaited recognition. In my inquisitive ignorance I sought the world gazetteer and located this strange territory, then, with the overflowing self-assurance of youth, I suggested, in my report to this master of metallurgical science, that certain tests be made on rebellious material of which he had spoken. Whether the seriousness or humor of the situation or my precociousness appealed to him is of little moment, but shortly thereafter I abandoned the civilization of Europe to seek fortune in the far distant and forbidding West. He brought me here as research metallurgist in 1900. I prized his advice and friendship until his death, as I cherish now his memory and find inspiration in his great example. Three long decades have passed since my arrival at Morenci, during which time I have seen the territory of “silver and sunshine” transformed into a state of “copper and culture,” nor, in my opinion, have we begun to appraise the assets of Arizona. Rich and abundant are its resources, in smiling skies, fertile soil, and in the profligate treasures of its subsoil. Instead of shrinking from this much maligned “land of thorns, tarantulas, snakes and heat,” I have come to love its mountains, its mesas and its men. Its mines are as jewels in

the crown of the Third Kingdom. These things I mention because there may be many in my audience ignorant as I was of the promise of this favored land. I fully appreciate the sincerity of an early Arizona historian who characterized it as—

“The state of every state the pride
Beloved by heaven and all the world
beside.”

It is extraneous to my subject to call attention to this land of wonder for sightseer and scientist; of this region so rich in material for the pen of the poet and the brush of an artist; of this territory of sublime chaos from which order has been wrought by the purpose and idealism, as well as the resolute work of the engineering profession, nevertheless to do so gives background to the picture I would paint of the far-flung mineral kingdom, the romance of its growth, its influence on advancing civilization, and of the condition of vassalage which its power imposes on all people.

THE true significance of the phrase “the mineral kingdom” must first of all be realized; it is not merely one of the three divisions into which natural objects are classified, it represents a realm of present and potential wealth of tremendous import and far-reaching influence; yet its domain is definitely circumscribed, its dominion is transitory, nor can its realm be perpetuated once the substance is exhausted. It holds sway over all the earth, its power is autocratic and despotic, and, as we have come to appreciate its vital force and have risen from savagery to civilization, so we have been reduced to a condition of vassalage. We are servants to the monarchy of minerals; we enjoy its patrimony. This Third Kingdom wields its scepter over our social structure; it gov-

* Dean, College of Mining, University of California.
Address delivered at University of Arizona, Tucson, Ariz., December 2, 1930.



erns the evolution and growth of industry; it conditions the strength of nations; it is the motivating force of world progress.

Mineral products are so essential and so commonplace that we demand and accept them with little appreciation; they are the very foundation of our prosperity, and yet, in our obtrusive opulence and smug ignorance, we seldom give thought to the fact that they are exhaustible by use and non-replenishable. Our riches and our wealth are but the transformed material gifts with which our land has been so bounteously endowed and without which the United States would still be a trackless waste. Its soil would be fertile; its terrain but sparsely peopled. Fifty years ago the census of Arizona gave the population as 41,580, today it approaches half a million. In 1880 the total assessed valuation of all property within the territory was \$11,000,000, whereas last year the value of the metal output alone was 158½ million dollars.

The animal and vegetal kingdoms have no limitations of territory nor of life. Fauna and flora flourish everywhere, and if the soil be exhausted of life-giving properties it can be replenished; if uncongenial, a new field may be found; seeds may be transplanted, stock acclimatized, the intelligent activities of man may make arid lands fertile, as witness the reclamation of the Salt River Valley. So long as the sun shines and clouds gather a perpetual harvest is assured. Nature never apologized for her elemental laws; they have no exceptions; she knows no miracles and the self-activity of the universe quite transcends our experiences. The land returns its increase and the farmer looks to our benevolent government for relief from the dilemma of his own fertility. In the divine order of the universe that

which is generously supplied is quickly dissipated; the supply of food is constant, but unless instantly consumed it perishes, nor does cloth or hide long resist the ravages of years. Our desires for food and raiment, urgent as they may be, are shortly satisfied. These things are ephemeral.

Agriculture offers a perennial source of perishable wealth, whereas mining yields a permanent form from a transient source. The products of the Third Kingdom alone endure and all tangible wealth has been wrought therefrom. It is interesting to trace the effect which mining has had on the development of the human race, on the expansion of geographic frontiers, on the colonization of lands, on the rise and fall of empires, on literature, history, laws, the arts, culture; in fact, upon all that we call civilization. Throughout the fabric of man's accomplishment we find the mineral threads intricately and intimately woven.

Emerging from pithecoïd ancestry our forbears, with conscious purpose taking the place of instinct, but still with brute-like impulse, used stones as missiles with which to kill their prey. The pangs of hunger initiated the chase and zoomimic man set forth to satisfy his wants. Hard rocks were broken and the sharp edges served the slayer. Flints were fashioned into arrow points and aboriginal tribes halted at places where minerals served their purpose. The glitter of gold ministered to age-old vanities and bright mineral pigments, oxides of iron, copper and other metals were used as powder and paint to make or mar the human form divine. In this respect modern society exhibits a frequent tendency to revert to type, for children will throw stones and flaming youth follows its barbaric customs, to add to personal appeal or repulsiveness. Primitive conceits have not changed; gold, precious stones

and other mineral baubles are still used for personal adornment, the magnificence of the display being suggestive of social status. It is fashion's decree.

THE record of man's attainment begins with the recognition of the value of minerals. The distinguishing characteristic of humans, separating them from other animals, is the inheritance of knowledge which each generation can derive from the past. It may be transmitted orally and be distorted in the telling. Papyrus and paper are perishable, and, if the record is to persist, copying is necessary, with the probability of false translation or interpretation. Archaeology takes up the thread of history when documentary evidence fails, but lifting the curtain to peer into the periods of geologic time, far antedating the limits of archaeology, we find the fragmentary evidence of the life history of the earth strewn along a rock-ribbed path, the sermons are in stones, the texts in the fossils. Mineral milestones mark time's long trail, and the accumulated experiences of man, properly recorded, exalts the state of humanity. Ideographs, cuneiform tablets, stela, graphic inscriptions graven on stone, all indicate the desire of ancient Egyptians and Babylonians to record for posterity the culture of their day. How appealing is the symbolism of the pyramids; with what loud voice does the silent Sphinx proclaim the splendor of the masons' work and the tombs of the dynastic kings reveal mute evidence of the zenith of arts, crafts and guilds long since forgotten. We possess records of but a tithe of the intellectual efforts of time. The Temple of Achievement which we shall leave for the generations to follow will be of the same nature, monuments fabricated from the products of

the Third Kingdom with the lessons to be deduced from them.

All the world acclaims a hero. The Greek and Roman classics live on, not solely because of the beauty and purity of the lines but for the strength and virility of the adventurous spirits therein portrayed. The Olympian hierarchy is extolled in Homeric and Vergilic poems. Much of the old literature that survives has to do with men of the mountains and the mines. Hephestus, Cadmus, Jason, Medea, these and many others, how truly they envisage the modern Argonauts, those who have touched the primal energies, who have pushed back the horizons on land and sea, conquered the waste places, harnessed the torrent, wrenched from nature the key to her rock-bound treasure vaults and exposed her mineral cache.

TO what extent empiricism directed the mining and metallurgical arts in earlier days we may never know. I am of the opinion that reasoned intelligence rather than fortuitous circumstance accounts for the high development of the industry evidenced by the fragmentary records. The monumental translation of *De Re Metallica*, by Mr. and Mrs. Herbert Hoover, to the mining fraternity of today reads like a fairy tale, and yet we may profit from its close study. The renaissance ushered in a period of scientific and economic development which it is well to bear in mind when reviewing the record of the last century and the intense industrialism of today. It was the discovery of gold and silver in the New World which made possible a monetary standard and thus stabilized and expanded trade. Wealth was accumulated and scientific work gained a new impetus. This was the age of Leonardo da Vinci, supreme in his many roles as painter, sculptor, architect, physicist and engineer; of Michael Angelo; of Paracelsus, the alchemist charlatan, who having worked in the mines of the Tyrol and learned something of the ailments of miners, proclaimed a new school of pharmaceutical quackery; of Copernicus, of Harvey, of Kepler, Galileo, and that champion of the experimental method in scientific work Francis Bacon. This presaged the period of applied science in the latter part of the eighteenth century and heralded the machine age of the present. Franklin, Faraday, Coulomb, Cavendish, Dalton, Galvani and Volta delved into the fields of electrostatics, dynamics or chemistry. Newcome and Watt contributed to the mechanical sciences, all pioneers in the development and utilization of other than human energy to do work. About this time Adam Smith gave to the world his enduring work on the science of economics, "The Wealth of Nations," in which he advocated natural

liberty, the ready flow of trade, international good will, because of the eccentricity in distribution of nature's gifts. In the last 100 years the mineral kingdom has had its greatest development because of the manifold needs of this mechanized age. In this period the world's output of copper has increased on an average of 53 percent per decade until now it approaches 2,000,000 tons per annum. Since 1900 the world production of copper has increased 307 percent, of the United States 338 percent, and of Arizona 700 percent. Arizona now contributes 42 percent to that of the whole country—as much as the combined output of Utah, Montana and Michigan—and 19.8 percent of the world's total.

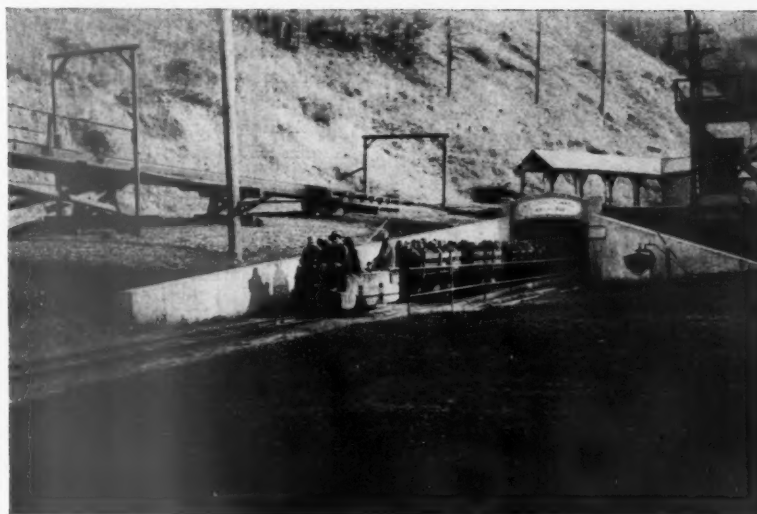
The Lord Chancellor of England, Sir Francis Bacon, in the early part of the seventeenth century, with conscious power and statesmanlike eloquence set at rest the prolonged controversy between adherents to the divergent schools of Platonic and Aristotelian doctrines. Plato, the idealist, dreamed of an Utopian society, but in bemoaning the impossibility of its organization, apostrophized the fact that men are acquisitive, ambitious, competitive and covetous, hence the encroachment of one group on another, the rivalry for resources and the clash of conflict. Aristotle, the peripatetic philosopher, denounced the Platonic vision of a Utopia, claiming that he who can foresee with his mind is by nature intended to be lord and master; and that he who can work only with his body is by nature a slave. Was this prophetic of the present status of political and commercial control of mineral resources? Bacon envisaged a world wherein perfected science controls a perfect social order, man making of the raw materials whatever Utopia he may choose.

THE lust of power determines imperialistic policies, and throughout history the major conflicts have been waged for the coveted possession of mineral lands. War seldom enters save where wealth allures. Disturbing as these thoughts may be, we are aware of the truth and can not disregard it. Nations have become powerful as they gained control and exploited the Third Kingdom. The hegemony of Athens was established after the Battles of Thermopylae and Salamis, financed by the taxes levied upon the silver mines of Laurium. Greed and avarice determined the actions of Cortez and his cohorts when confronted by Montezuma's price-

less presents of gold and silver; thus was Mexico annexed to Spain, and thus was Mexico freed 300 years later from the Spanish yoke, for the Revolutionary War of 1813 was financed by the bullion stolen by Hidalgo from the carcel of Guanajuato which came from the Veta Madre. The overthrow of the Huguenots and the realization of Richelieu's ambition followed the capture of La Rochelle, the center of salt production, which to seventeenth century France was possibly its greatest natural resource.

At the close of the Thirty Year War, in 1648, Alsace was given to France. The end of the Bourbon monarchy came with the Revolutionary War of 1792, when the alien elements in Alsace and Lorraine were assimilated by the French, but dismemberment began after Waterloo in 1815, when Prussia acquired the Saar coal fields and purposefully set herself to gain the territory lost by the Treaty of Westphalia in 1648. Bismarck characterized the Franco-Prussian War as "a war of blood and iron," and the international boundary of 1871 was drawn by geologists with meticulous care to include all of the iron of northeastern France. Subsequently, however, France proved the extension westward in the valley of the Moselle. The Teutonic debauch of greed led to the World War of 1914, and with well-planned strategy the initial blows were struck in the Briey Longwy iron districts and the Pas de Calais coal fields of France and Belgium. For four long years the battle lines wavered but a few miles from the city of Lens. By the Treaty of Versailles the vast mineral reserves of Alsace Lorraine were returned to France and Germany was temporarily halted in her march toward world dominion and industrial supremacy. The strategy of minerals!

The discovery of gold at Bendigo and Ballarat precipitated Australia into nationhood, as the finding of the yellow metal in the Transvaal led subsequently to the great Union of South Africa. The code agreed upon by miners during the phenomenal days of the gold boom in California and the Comstock was more rigidly respected than any legislative act or Federal edict; it was maintained in



the Mineral Land Law of 1872 and is still operative. The billion dollars taken from the mother lode of California played no small part in shaping the economic and social destiny of the United States during the period of the Civil War.

IN the seventeenth century some unknown genius in England conceived the idea of transporting coal from Newcastle in carts drawn over parallel lines of planks laid end to end. From this the railways were ultimately developed. In 1769 a French army officer, Cagnot, built the first self-steam propelled carriage, and from then on there has been continuous improvement in mechanical traction. The first tramway built in the United States was at Quincy, Mass.; it was completed in 1826, was 3 miles long, and was made for the purpose of transporting the granite used in the building of the Bunker Hill Monument. The next tramway was built a year later in Pennsylvania to carry anthracite to the Lehigh River. The wooden rails were faced with iron. Today, of all the freight carried by the Class A railroads of the United States, 58 percent is of mineral raw materials, and of the total of approximately 700,000,000 tons, nearly two-thirds is coal. The steam railroads, however, annually consume 35 percent of all the coal they transport in the propulsion of trains. Crude oil and refined petroleum products constitute about one-tenth of the mineral freight of the railroads, of which they consume 70,000,000 barrels. While speaking of oil transportation, it is well to mention that 100,000 miles of pipe lines in the United States through which 16,000,000 barrels pass, and that 23,000,000 barrels were carried by tankers through the Panama Canal last year, contributing 20 percent of the total tolls collected. The mines and smelters of the country consume as much oil as does the United States Navy.

Though we are at present flooded with oil, to the embarrassment of producer and refiner alike, we have constantly before us the menace of ultimate exhaustion of natural pools. Meanwhile, there is feverish search throughout the world for new fields. Wherever it is to come from we must have oil in amounts almost incredible to meet the demands of our oil-burning navy and merchant fleet, to supply our railroads, industries, and home with fuel oil, to lubricate our machines, to provide the ocean of gasoline required for autos, trucks, tractors, power boats and airplanes. The internal combustion engine, by reason of its efficiency, convenience and compactness, has brought us to the verge of another industrial revolution as far reaching in its effects as the one which derived so much of its impetus from coal. Already it has resulted in the development of a new and most pervasive system of transportation, dependent upon petroleum and insistent in its demand for better roads. The automobile supports scores of new industries, drains the labor market, profoundly affects real estate values and upsets the economy of households. It is made of metal and propelled by mineral fuel; moreover automotive travel has called for a program of highway building which has endless ramifications, for all of which mined macadam, or cement, gravel and oil, or asphalt are needed. Industry gives birth to industry.

THIS may be the opportune place to introduce a very delicate topic, one that touches us all, one that I speak of feelingly and with much trepidation. I refer to that which is seemingly as inescapable as death itself—taxation. The speed and complexity of modern life demands all manner of facilities to expedite our purposes. Rivers are

dammed, power developed, highways built, towns improved, cities beautified, all public benefits for the people compulsorily financed by the people. The support of government is a serious item in our household and industrial budgets. I think it is a fair statement that many of the so-called public demands are but the reflection of the minds of small minorities actuated by self-interest. I believe that if the people would carefully and critically scan governmental disbursements and exercise an intelligent censorship, some relief might be found for the killing burden. Is it too much to hope that change may come in our electorate from demagogues whose concept of public duty is to direct their efforts to catch the whimsical echo of a temporary popular approval, to representatives of the people, conscious of their desires and needs, who, without swapping of votes, will courageously support a righteous cause?

The mining industry suffers a heavy penalty, because, in the eyes of politicians, ore is considered to be a God-given gift, and mineral land may be had for the asking. They fail to appraise the enormous risk taken when man sinks his money in the ground, and to appreciate the fact that from the unnumbered prospects but few mines emerge. Our Federal and state legislatures should frame the laws so as to encourage and permit of the unrestricted and largest development of the mineral resources consistent with sound public policy and principles of equity as between mining and other industries. That mines carry an excessive part of the total tax there is no question, and yet the fault may be largely our own. The mining interests should have greater concern in political units and public expenditures; more over the people at large, when apprised

of the discrimination and the problems besetting the industry, will support remedial measures. From the natural resource and closely related industries \$778,000,000 were extracted for Federal, state and local taxes in the United States last year, of which sum \$507,000,000 was from mining, metal, and metal products companies. In 1929 in Arizona mining property paid 42 percent of the state's taxes. The petroleum industry of the country contributed as Federal income, state income and franchise taxes about \$120,000,000, in addition to which the motoristic public donated \$305,000,000 as state gas taxes. In Michigan, Minnesota and Wisconsin each proven ton of ore in the ground is taxed until it is mined. Minnesota imposes a heavier tax burden on mines than any other industry or real property; a dollar invested in mines has double the tax of a dollar invested in farms, in addition to which there is a 6 percent tax levied on income from the iron mines under the name of occupational tax. In an address by Mr. Hoover before the American Mining Congress, while Secretary of Commerce, he stated that the mineral industries in their raw materials stage alone, pay direct taxes to the Government amounting to over five times all the other raw material industries put together. Inasmuch as both mining and agriculture are basic industries, dare we expect that mine relief will ever become a national issue or a plank in a political platform?

It is difficult to get accurate data on the number of men engaged in winning minerals from the earth. The United States Department of Labor fails to catalogue them except in overlapping groups. Mr. Hoover, in the address above referred to, estimated there were 2,000,000 men, on whom there were probably four times as many dependents, working in mines and quarries. The appraised value of the annual total output of minerals in the United States is $8\frac{1}{2}$ billion dollars, which in the beneficiation into marketable goods gives work to an equal number of men with as many more dependents. The manufactured products are of twice the value of the raw substances. When they reach the ultimate consumer the value is figured at close to \$20,000,000,000, about the equivalent of that of all agricultural products. The value of the mineral output of Arizona last year was \$158,000,000, that of agricultural products, including livestock and lumber, \$75,000,000, more than a two to one ratio.

The mineral kingdom exerts a profound influence on human activity and relationships. Never a moment of the day but what we are in touch with or need of its products. Truly we are its vassals.

THUS far in my discourse I have presented a number of word pictures illustrating the importance of and emphasizing our dependence upon the mineral kingdom. We must, however, recognize its peculiarities, its limitations, and the obligations which they impose upon mankind. Mineral deposits constitute a natural resource differing in nearly all respects from other forms of nature's beneficent bounty; they are restricted in area, limited in quantity and erratically distributed. The birth certificate of a mining enterprise is also its death warrant, for once exhausted it can never be duplicated in the same place. Intellect, ingenuity, science, all knowledge, can never rejuvenate a spent field, nor can the will or wealth of man ever cause an ore body to exist where nature ordained it should not be. It is not a matter of clime or race, of latitude or longitude, of coast line or mountain range, nor of political boundary. Where it is, there it is. The industry is neither local nor provincial, urban nor rural, but it is stationary as to place. The form and power of empires, however, have been molded by the possession of mineral lands. The Roman Empire reached its supremacy after it attained control of the mines of the Iberian Peninsula. England, Germany and the United States are the three powers largely owing to the control exercised by them over minerals, especially coal and iron. The United States has been generously endowed, for we produce from little more than one-twentieth of the earth's land area, and with but 6 percent of its population, 40 percent of the world's aluminum, 60 percent of its copper, 51 percent pig iron, 40 percent of the zinc, 39 percent of coal, 71 percent of petroleum, 38 percent of the phosphates, and 70 percent of the sulphur. We do over 40 percent of the world's work, yet we produce but very few minerals in such quantity as to affect appreciably the world market. The eight major countries—the United States, United Kingdom, France, Germany, Belgium, Italy, Spain, and Japan—require, to maintain their industries, 80 percent of all the major minerals mined, while these same countries control politically and commercially an even greater part of these minerals. There are certain strategic raw materials, as tin, chromium, platinum, antimony, nickel, and a few others, essential in time of war, not found in the United States, and for which we are dependent upon the good will of other nationals. No country is self-contained or self-sustaining, no country can consume all of its varied mineral products; there must, then, be freedom of commodity movement, lanes of trade must be maintained and protected. Rivalry and envy engender ill

will and bitter consequences. The wise development of the resources which constitute and sustain the political, commercial and social power of a nation will long command attention. International movement is inevitable and while the stream of mineral trade may be retarded, diverted or temporarily suspended, it can not be permanently stopped.

ANOTHER feature of the industrial minerals to be noted is that they are in large part complementary, one without the ready availability of another may be of little value; thus for the manufacture of pig iron, coal, limestone, and iron ore must be brought together, and in the manufacture of steels other elements, as manganese, chromium, nickel, vanadium, and the like, are required. Coal and iron ores are the most plentiful and found in the highest degree of concentration of any of the industrial minerals; they constitute the greater part both by weight and value of the world's mineral output. Where these two exist in economic complementary relationship, there industry thrives. Ninety percent of the world's steel comes from the shores of the north Atlantic, the eastern United States, and the maritime provinces of Canada on the one side; England, France and Germany on the other. Here the financial, industrial and political power of the world is centralized, but to maintain it the ready interchange of essential substance must be unhampered. To attempt to block trade by erecting artificial barriers, due to the policies of changing governments, is to court industrial stagnation and world disaster. Here on the north Atlantic shores men of vision, skill, organizing ability, and resourceful initiative have taken full advantage of the existing mineral resources and established colossal works in which to fabricate goods needed in all progressive countries.

With the exception of the solid and liquid fuels, iron ores, and the non-metallics, nearly all mineral substances are of great complexity, and of their enormous bulk there is but a small fraction finally marketed. Processes of treatment are delicate, intricate and elaborate. Not only must technique be of a high order but economic policies must be sound. Vast capital expenditures are involved; the element of profit is not always certain. There are many hazards other than the vagaries of ore shoots; fluctuating markets, inherent risks, exorbitant taxation, legislative restrictions and prescriptions are factors difficult to evaluate while political busy bodies, obsolete statutes and governmental interference contribute to the precariousness of mining enterprise.

The search for new mines is constant and diligent yet seemingly unsuccessful, while the consumption of all mineral

products increases by leaps and bounds. High-grade masses are approaching exhaustion and leaner, more complex material is being exploited. The object of mining is to minister to man's wants, provided always it can be done at a profit. Economics and technology are inseparably associated. The item of taxation may assume serious proportions in the cost sheet and labor will always loom large in the monthly statement. Freight rates, supplies, labor, legislation, price tendencies, political conditions, these things determine the color of the ink in our balance sheets as much as the geologic occurrence or mineralogic association. The future of the copper industry in the United States depends upon our ability to treat mineralized rock carrying 15 to 20 pounds of the red metal per ton. It can only be accomplished by the application of scientific principles in management, in practices, by the integration of units under central efficient control, by wholesale methods and intelligent marketing of the final products.

NATURE has been prodigal with mineral treasures in the United States; we have been profligate in working them. Wasteful practices have been excused under the urge to produce, immediate gain has ignored future consequence. Mining is the source of our present wealth, but are not our mineral resources also the basis of our future security? Many will argue that present-day interests should not be sacrificed for the uncertain needs of tomorrow. It is a wise nation that thinks of future needs and therefore lives within its means. Today we are disturbed by enforced curtailment consequent upon an orgy of overproduction; mining has not yet established itself upon a sound foundation of economic law even though the industry shaped by the hand of educated skill has assumed such colossal size. The subject of elimination of waste, conservation, and highest utilization is before us and demands serious thought, for mineral resources are non-replenishable. While they last they are great national assets. Unmined mineral costs us nothing. In nature's storehouse it pays no rent; it is available to us at our command, ready in any emergency of peace or war. The selfish tendencies of individuals should be curbed in order that the greatest good to the industry and the Nation may obtain. Regulations, wisely conceived and properly administered, may not only bring about larger returns and greater opportunities but prolong



the life of many mining projects. Self-determination may be more desirable than government dictation.

I have hurriedly sketched some of the aspects of the mineral kingdom, with its high lights of history, adventure, romance and reward, with its shadows of uncertainty, risk and limitation. Its resources are being exploited on a prodigious scale; constantly increased demands are made upon it. We need to balance the account and see how long this natural reserve bank will be able to honor its regular drafts. The simple life no longer satisfies, our family, community and national life have alike become strenuous; there have been striking and stirring changes in the last few years in our habits of thought, in our relationships man to man and nation to nation. We live in an age wherein all things have become mechanicalized, if not automatic. The social fabric of the world has been rocked by an upheaval of outspoken thought, of insistence on recognition, effecting a metamorphism both structural and dynamic. In the incipency of the change the significance of the gathering social forces was not apparent, but today if we are to simulate men, resolutely facing the future, we must appraise all factors and reconcile opposing factions. Men, money, and minerals must be found, brought together, put to work, and relationships established between them so that the wants of society are satisfied and the progress of the Nation assured. This generation is not fanciful, it is not deluded by fictitious dreams; we have come to an age of demonstration, of tangibility, of realism. We must reckon with the human unit, and unless harmony prevails all the accomplishments of investigative and inventive genius, all the improvements in mechanical appliances, all the departures in practices and modifications of methods count for little. There

is an insistent call for enlightenment, a persistent demand for intellectual emancipation. And by this means alone can the problems of the mineral industry be solved. "The foundation of every state is the education of its youth" said the Greek philosopher Diogenes. In the hands of youth rests the trusteeship of posterity. Dr. Robert Gordon Sproul, president of the University of California, at his inauguration said: "The university should reveal to the people the unity of the channels through which life flows, and minister to the purification of its currents by making straight and clear the way for the liberation of the spirit of men from tyranny of space and time, not by running away from the world but by mastering it."

THE more richly mineralized portions of the earth's crusts have already been partly exhausted; there are few large tracts of land that have escaped the keenly observant eye of the prospector; the future of the industry is in the vast masses of lean and complex ores. New mines will be made, not found. After 60 years of continuous and expanding work the Morenci mines of Graham County, Ariz., have greater ore reserves than were ever before computed and rank among the big mines of the world. The Miami Copper Company project, thought five years ago to be on its last legs, has, through the patient effort and genius of its manager, Mr. MacLennan, taken a new lease of life with known ore exceeding 100,000,000 tons, carrying 19 pounds of copper to the ton. At Ray, Bisbee and Jerome the same story. As the precepts of science are heeded, ore deposits of great magnitude and variety are evolving from what has hitherto been considered waste. Mineral resources are in this sense being replenished, not by the acts of nature but by the quickened mentality of man.

For centuries past civilization has followed the pick of the nomadic prospector, for years to come knights of an intellectual army will blaze the way to new conquests, expanding the frontiers of industry, reshaping the map of the mineral kingdom. The mining industry needs young men, vigorous, forceful, well trained. Men not glossed with an educational veneer, but with an intellectual foundation well and truly laid; men with ambition and aggression; men with breadth of vision and confident outlook. We must be mindful of the youth who must shortly fill our shoes, who must carry on as we go off shift. Cicero asked 2,000 years ago, as we may ask today, "What greater gift or better can we offer to the state than if we teach and train up youth." They need stimulating contacts, inspirational teaching. All instruction that is not new and vital to the personality at the time when it comes to expression is a dead and hopeless exercise.

Here in these fine halls dedicated to learning, on this lovely campus with its energizing atmosphere, at this University of Arizona, wisely conceived by its founders in 1885, well equipped, ably staffed, generously supported by a sympathetic legislature and enthusiastic citizenry, I see, on my return to your midst, the educational heart of the youngest, most virile state of the Union, animated by lofty ideals, controlled by sound policies, eager to meet the challenge of changing times. In the words of Dr. Benjamin Ide Wheeler, I feel secure in saying that, "Here, for centuries to come, each generation will transmit to its successors the lessons of the past; here, by the contagion of sympathy, each generation will inspire its sons and daughters to nobler living; here, by the mystery of inspiration, vision shall awaken vision and personality shall give its spiritual life blood to the handing on of life, like a fire by the handing on of the racer's torch." Thus will our vassalage in the mineral kingdom be exalted.

THE SILVER SITUATION

(From page 131)

silver for all internal purposes in India and China might be fostered.

This does not prohibit or impair the desired benefits of a gold exchange standard for foreign trade.

His third suggestion is that the duty on silver into India might be removed to permit of natural absorption by that country.

IN THE December issue of *Mining and Metallurgy*, Harrington Emerson, of New York, makes the interesting suggestion that the ratio between silver and gold can be absolutely determined by the dominant industrial nation in the world. I quote the following two paragraphs from his article:

"Is or is not the United States that nation? No one has presented any valid argument to disprove this inherent power of the United States. If more money is owed to the United States Government in taxes each year than to any other government, I believe that it can determine any ratio it considers desirable—any ratio between 6:1 and 60:1 as the value of the metals. Between these two ratios there is every argument in favor of 6:1 as compared to 60:1; and what is most satisfying is that in benefiting ourselves by a low ratio we would benefit every other nation as well, especially our own neighbors, along and across the Pacific and those who owe us so much money which they find it hard to pay.

"The value of the currency depends on the ability of the government to make good. The United States can make any piece of paper it chooses to stamp equal to gold if it can absorb all the issue in taxes. And the United States collects \$4,000,000,000 annually in taxes. The present silver certificates issued against the deposit of silver dollars (worth 27 cents) are not legal tender, but they are receivable for taxes, stand at par with gold, which is legal tender, and has intrinsic value. The silver dollars are legal tender, have a shameful intrinsic value and are not convertible into anything else, yet circulate at par like the certificates because they are receivable for taxes."

While Mr. Emerson is not arguing for bimetalism, his point is reminiscent of the basic question involved in the old free silver controversy, which was whether the United States alone was strong enough to fix and maintain the 16 to 1 ratio. Whether it is or not, there can be no doubt that such a ratio, or any ratio, could be pegged by the concerted action of the great nations of the world.

One other suggested plan for improving the situation of silver has been widely discussed. It contemplates getting the war lords of China together, putting an end to China's internal disorders, and lending her several hundred million ounces for road building and other internal improvements. If China were pacified and her government stabilized, and large sums of new money put into circulation through public works, the people would turn from fighting to working, and China would promptly resume its character of a great consumer of silver. This plan obviously involves very delicate international relations, and is more of a political than an economic proposal, although it would certainly have salutary economic effects.

INSTEAD of devoting any more time to suggested remedies, it may be of interest to add a few facts about silver as a metal.

The world production of silver from the discovery of America to 1927 was somewhat more than 14,000,000,000 ounces, which is 14 times the weight of all the gold produced during that same period, or a ratio by volume of 14 to 1.

It is not true that in recent years there has been an enormous relative increase in the production of silver as compared with gold. Here are the recent ratios:

1900	14:1
1905	9:1
1910	11:1
1915	8:1
1920	11:1
1925	13:1
1928	13:1

One-third of all the silver output since 1493 was produced in the 39 years from 1889 to 1927. And yet the silver increase has been much less than the increase in gold, in copper, in lead and in zinc.

Gold production from 1493 to 1930 has amounted to approximately 1,042,850,000 ounces, of which about 555,350,000 ounces, or slightly more than one-half, have been produced during the twentieth century, that is during the past 30 years.

There has been enormous increase in gold production since the discovery of the cyanide process in 1887, and the development of the gold fields of South Africa. But for this increase the demonetization of silver would probably not have been possible.

The argument that silver has declined because of overproduction is fallacious. Production figures show that the output of silver has not increased as rapidly as trade expansion warranted, or as fast as other metals or commodities. Moreover, consumption has kept pace with production, although at falling prices during the past few years.

The recent fall in silver was, of course, due to an excess of supply over demand. The excessive supply was partly due to an increased mine production in 1929, but more particularly to the sale of old silver held by governments. The subnormal demand has been due to conditions in China and India, as already explained.

THE value of gold to silver now stands at a ratio of about 66 to 1. It was formerly fixed by law in the bimetallic monetary standard at 16 to 1. I have already stated that the ratio of production of silver to gold in the whole period since the discovery of America has been about 14 to 1.

North and South America have produced about 84 percent of the world's production of silver. Silver mining is essentially an American industry. The United States should be as solicitous about its silver industry as it is about its steel industry. (Cont'd on page 144)



LEGISLATIVE REVIEW

WITH the sessions of the Seventy-first Congress expiring by constitutional requirement on March 4, the Senate and House showed unusual activity during the past month in disposing of pressing legislative proposals. They were inspired by the realization that unless acted on before that deadline all pending legislation would go into the discard, and would have to begin over again its course through the required procedure of introduction, committee action, and consideration by the House and Senate in the Seventy-second Congress. Fears were entertained of a legislative jam at the end of the session in March which might prevent the passage of necessary bills and force an extra session, but the latter possibility was generally deplored by congressional leaders and extra efforts made by them to wind up the legislative program at high noon on March 4. Continued controversy between Congress and the President over the scope and form of drought and unemployment relief measures operated to keep the possibility of an extra session in the forefront up to the very end of the session. Congressmen were threatening to hold up all of the bills

making appropriations for the support of the Government during the year beginning July 1 next unless funds were appropriated to relieve distress in these areas through the allotment of money for food and other purposes. A compromise was finally approved to appropriate an additional \$20,000,000 to the \$45,000,000 previously appropriated for seed loans, the first named fund to be used for "crop rehabilitation" which was construed as permitting loans for food, clothing and medicines for the needy.

Legislation proposing a restriction on oil imports in view of the depressed condition of the domestic producing industry, and to forbid the importation of goods mined or produced by convict, forced or indentured labor, the latter aimed mainly at Russia because of heavy imports of manganese, coal and other products, advanced from the committee stages to the floor of Congress for action. The Senate had before it an oil restriction bill and the House a measure barring convict labor goods on report from their committees.

Although it was conceded that there would be no legislation on the subject at this session, a bill was introduced in

anticipation of action at the next regular session in December, providing for a percentage depletion system for mines, which would replace the present discovery depletion system. The Joint Congressional Committee on Internal Revenue Taxation, which considered this matter at a hearing in December, did not expect to receive a further report from its investigating staff on the question before next spring.

COPPER TARIFF

Anticipating possible tariff revision legislation in the new Congress next winter, advocates of duties on copper, representing the industry in Michigan, Montana and Arizona, introduced and persuaded the Senate to pass a resolution calling on the Tariff Commission for a report on the production cost differences in the copper industry in the United States and foreign countries, and a similar inquiry on lead was proposed in another resolution. The copper inquiry has already been launched by the Tariff Commission. In introducing the resolution for the investigation on behalf of himself and Senators Wheeler, of Montana, and Vandenberg, of Michigan, Senator Hayden, of Arizona, said:

"The resolution directs the Tariff Commission to investigate the cost of production in the United States and in foreign countries of all forms of copper mentioned in the free list of the Smoot-Hawley Tariff Act of 1930, which includes copper ore and copper in plates, bars, ingots, or pigs that now enter the American market without payment of import duty. The commission is required to report upon the differences in the cost of mining and smelting foreign and domestic copper for the last three calendar years in order to make a proper comparison between marketing conditions in periods of prosperity and depression.

"The investigation could not be ordered under the flexible provision of the tariff act because there is no duty on unmanufactured copper. The resolution therefore refers to section 332 of the act which authorizes such investigations and reports to be made by the Tariff Commission upon request of the President or either branch of Congress. It is in accordance with the terms of that section that the commission has about completed a study of the comparative cost during a 3-year period of producing crude petroleum in the oil fields of the United States and Venezuela and the delivery of the same to refineries on the Atlantic seaboard.

"It is expected that the investigation can be completed in ample time for the Tariff Commission to submit its report when Congress convenes in regular session next December. If a revision of any of the schedules of the present tariff law is undertaken by the new Congress, a proper foundation of facts will be laid

upon which consideration of the effect of a copper tariff may be based.

"There was no demand for an import duty on copper while the Hawley-Smoot bill was under consideration by Congress. No one representing the industry appeared before the House Committee on Ways and Means or the Senate Committee on Finance asking for such a tariff. The price of copper remained at about 18 cents and did not break until after the tariff bill had passed both Houses and was no longer subject to amendment. Since that time the market price has been practically cut in half.

"The resolution is sponsored by the junior Senators from three States in the Union in which have been mined about two-thirds of all American copper and which produce over one-third of the copper of the world. The copper mines in these and the other Western States are now operating at a reduced rate of production with the consequent loss of employment and wages to thousands of American miners. The principal competing mines are located in Canada, South America, and Africa, where the amount of copper produced has greatly increased in the last three years."

Tax legislation was conspicuous by its absence in the session of Congress now closing. At the opening of the session last December it was decided that the state of the federal treasury would not permit the deduction on 1931 income tax returns of the 1 percent income tax deduction which had been allowed on 1930 returns, and similarly a proposal to deduct from net income contributions for unemployment relief was allowed to die. The only other tax proposal was a suggestion in a bill presented in the House to reduce the capital net gain and net loss tax and deduction from 12½ to 7 percent, and while the President had recommended a study of this question with a view to reducing the rates, no action was taken.

Measures looking to relief of the silver price situation were recommended by a sub-committee of the Senate Foreign Relations Committee headed by Senator Pittman, of Nevada, which had investigated the question in relation to trade relations with the Orient. These proposals embraced the calling of an international conference to stabilize the price of silver, to request foreign governments not to debase silver and for a silver loan to rehabilitate China.

The Senate passed and the House Mines and Mining Committee reported a bill to locate a mining experiment station on grounds of the University of Maryland near Washington, D. C., to enable administrative heads of the Bureau of Mines in the headquarters at Washington to conduct necessary preliminary tests which were described as necessary in mapping out detailed investigations for the other field stations and a replacement of facilities formerly available at the Washington headquarters.

A number of proposals were advanced

for investigations as to combinations in connection with oil and gasoline prices and for regulation of pipeline companies, and the marking of imported petroleum products. Amendment of the leasing law to provide for unit development of oil and gas leases thereunder was also proposed.

Legislation came out of the House Public Lands Committee to expedite the patenting of oil shale land claims.

Reconsidering its former decision to recommend an absolute prohibition of immigration for the next two years, the House Committee on Immigration brought in a bill for a 90 percent restriction of immigration.

As the session neared its close there seemed no possibility of action by Congress on the disposition of the Muscle Shoals, Ala., nitrate and power project, which has been pending for 10 years. The Congressional conferees were unable to adjust the differences between the Senate and House bills which were passed on this question, the Senate bill proposing government operation, and the House bill to authorize lease of the project. Effort was made to attach Muscle Shoals legislation on the appropriation bill for the War Department, which supervises this project, but it failed.

As a measure of relief for the unemployment situation, Congress passed and the President approved a law to provide for the advance planning and regulated construction of public works. An investigation as to the causes of fluctuations in commodity and security values was proposed in a resolution by Senator Steiwer, of Oregon, and a Senate committee reported a resolution for an investigation of unemployment insurance systems in use by private interests in the United States and by foreign governments.

The following is a summary of legislation before Congress during the past month:

MINE DEPLETION

H. R. 16835. Mr. Timberlake (Rep., Colo.). This bill provides for a 33 1-3 percentage depletion rate for mines, in place of the present discovery provision of the internal revenue law. The bill reads as follows:

"That section 114 (b) (2) of the revenue act of 1928 is amended to read as follows: Percentage depletion for mines: In the case of mines the allowance for depletion shall be 33 1-3 percentum of the taxpayers' net income as defined in section 21 (computed (a) without allowance for depletion and (b) excluding such items of gross income and deductions as are not directly attributable to the operations of mineral or metal production from the property), except that in no case shall the depletion allowance be less than it would be if computed without reference to this paragraph." *Ways and Means.*

S. Res. 434. Mr. Hayden (Dem., Ariz.); Mr. Wheeler (Dem., Mont.) and Mr. Vandenberg (Rep., Mich.). This resolution directs the Tariff Commission to investigate the differences in the cost of producing copper during the years 1928 to 1930, inclusive, in the United States and foreign countries and to report to the Senate as soon as practicable. *Passed by the Senate.*

S. Res. 441. Mr. King (Dem., Utah). This resolution proposed to direct the Tariff Commission to investigate the domestic and foreign production costs of lead during the years 1928 to 1930, inclusive, and to report as soon as possible.

H. R. 16622. Mrs. Pratt (Rep., N. Y.). This bill proposed to reduce from 12½ to 7 percent the tax on capital net gains and losses. *Ways and Means.*

S. Res. 442 and 443. Mr. Pittman (Dem., Nev.). These resolutions request the President to call an international conference for the purpose of reaching an agreement as to the uses and status of silver as money; requesting India, Great Britain, France, Belgium and other governments to suspend the melting or debasing of silver coins and sales of silver so as to eliminate depressions in the price of silver; and to establish a silver pool to supply China with silver for coinage, using for this purpose silver dollars in the American Treasury or other silver. *Foreign Relations.*

S. 5888. Mr. Shortridge (Rep., Calif.). This bill proposes to coin 500,000 silver 50-cent pieces in commemoration of the 150th anniversary of the founding of the city of Los Angeles. *Banking and Currency.*

S. 6103. Mr. Fess (Rep., Ohio). This bill provides for the circulation by the Government in 1932 of a new silver quarter bearing a likeness of George Washington, in celebration of his 200th birthday anniversary. *Passed by the Senate and reported by the House Coinage Committee.*

H. R. 16973. Mr. Perkins (Rep., N. J.). This is similar to the foregoing. *Coinage.*

S. 5677. This bill authorizes the minting and sale of 500,000 medals in celebration of the 150th anniversary of the surrender of Lord Cornwallis at Yorktown. *Passed by the Senate.*

S. 5220. Mr. Tydings (Dem.) and Mr. Goldsborough (Rep.), Md. This bill proposes to establish at a cost of not more than \$350,000, on land to be donated by the University of Maryland at College Park, a mining experiment station of the Bureau of Mines. *Passed by the Senate and reported by the House Committee on Mines and Mining.*

S. 6092. Mr. Norbeck (Rep., S. D.). This bill proposes to add 40,000 acres of forest lands in the State of South

Dakota to the more than 60,000 acres now owned by the State, for maintenance as a public park by the State. The bill reserves to the Government all mineral resources in the land, which are to be disposed of by special legislation. *Passed by the Senate.*

H. R. 16914. Mr. Williamson (Rep., S. D.). This is similar to the foregoing. *Public Lands.*

S. 6104. Mr. King (Dem., Utah). This bill provides that hereafter no public lands in Utah shall be withdrawn from settlement, location, sale or entry except by act of Congress. *Public Lands.*

H. J. Res. 474. Mr. Temple (Rep., Pa.). This resolution would appropriate \$110,000 for the expenses of the International Geological Congress to be held in the United States in 1932. *Foreign Affairs.*

H. R. 15258. This bill would permit the development of valuable minerals in certain land in Wyoming. *Passed by the House.*

H. R. 14248. This bill authorizes prospecting permits and leases for asphalt, gilsonite, elaterite and other like substances in Utah. *Passed by the House.*

S. 1371. This bill authorizes the Southern Ute Indians in Utah, Colorado and New Mexico to sue in the Court of Claims in connection with lands taken by the Government or disposed of under the land laws. The bill prescribes that the value of the coal bearing lands shall be fixed at not more than \$15 per acre. *Passed by the Senate.*

H. R. 16625 and 16701. Mr. Timberlake (Rep., Colo.). These bills propose to grant certain land in Colorado for the benefit of the Colorado School of Mines upon payment by it of \$1.25 per acre, with a reservation of the minerals therein to the Government and the right to prospect for and mine the same. *Public Lands.*

H. R. 11969. This bill sets aside certain land in California to protect the water supply of the city of Los Angeles, but subjects the land to exploration, discovery, occupation, purchase, permit or lease under the mining laws. *Passed by the House.*

H. R. 3820. This bill provides that lands withdrawn from stock-raising homestead entries as valuable for oil or gas shall only apply to such minerals which are within the geologic structure of a producing oil or gas field. *Reported by the Senate Committee on Public Lands.*

S. 6133. Mr. Wheeler (Dem., Mont.). This bill provides that where lands subject to agricultural entry are subsequently classified as not containing oil, gas, phosphate, nitrate, potash, or asphaltic mineral deposits, unrestricted patents shall be issued for the entry. *Public Lands.*

The tomb of George Washington at Mount Vernon



OIL INQUIRY

H. Res. 341. Mr. Hoch (Rep., Kans.). This bill proposes to authorize a committee of 5 members of the House to consider and report legislation to remove restraint of trade and to conserve oil and gas. The investigation would cover the following:

The relationship between the price of gasoline from tank cars, tank wagons, and filling stations and the price of crude petroleum in the United States.

The retail price of gasoline and refined products of petroleum along the seaboard as compared to the retail price at points in the interior of the country, and with reference to the price at which crude petroleum, domestic or imported, is delivered at the refineries on the seaboard and at interior points.

The retail price of gasoline and refined products of petroleum at points adjacent to refining centers as compared to the retail price at points farther removed from such refining centers, having regard to the relative costs of transportation and other essential factors.

Any facts deemed essential by the said committee in determining whether there is artificial control of price, wholesale or retail, of crude petroleum or of gasoline or other refined products of crude petroleum, through combinations or agreements in unlawful restraint of trade or otherwise.

The ownership or control of pipe lines, and the interest, if any, direct or indirect, through corporate ownership, stock ownership, lease, interlocking directorate or otherwise in said pipe lines by any of the companies engaged in the producing, refining, or marketing of crude petroleum, gasoline, and other refined products of crude petroleum.

The ownership or control, if any, direct or indirect, by pipe-line companies of the sources of supply of crude petroleum, gasoline, or other refined products of crude petroleum.

The ownership or control, if any, direct or indirect, by pipe-line companies or companies engaged in the producing, refining, or marketing of crude petroleum, gasoline, or other refined products of crude petroleum.

The rates, rules, regulations, and conditions under which pipe lines are made available to the use of and for the service of the public, and particularly with reference to whether such rates, rules, regulations, or conditions afford equal and fair treatment of all legitimate interests, and any other facts in connection with the operation of said pipe lines

having to do with their use, without discrimination, as common carriers.

Whether the decree of the Supreme Court of the United States dissolving the Standard Oil Company is being violated, directly or indirectly, and whether there is combination or agreement, direct or indirect, between any of the so-called Standard Oil companies, their officers or agents, in violation of the terms or intent of said decree or of any of the acts of Congress against unlawful restraint of trade.

Any other facts, with reference to the regulation of interstate and foreign commerce, the restraint of trade, or the conservation of natural resources, as related to the oil and gas industry. *Rules.*

S. Res. 418. Mr. Nye (Rep., N. D.). This resolution would authorize a committee of five senators to investigate and report on petroleum prices, covering the following:

The cause or causes of the low price of crude oil in the United States and the margins between the price of crude oil and the selling price of the products of crude oil.

Whether said conditions have resulted in whole or in part from any contract, combination, in the form of a trust or otherwise, or conspiracy in restraint of trade and commerce among the several States and Territories or with foreign countries.

Whether said prices have been controlled, in whole or in part, by any corporation, joint-stock company, or corporate combination engaged in commerce among the several States and Territories or with foreign nations.

Whether such corporation, joint-stock company, or corporate combination, in purchasing crude oil, gasoline, and other petroleum products, by any order or practice of discrimination, boycotts, black lists, or in any manner discriminates against any particular oil field.

The organization, capitalization, profits, conduct and management of the business of such corporation or corporations, company or companies, and corporate combinations, if any.

The stocks of crude oil, gasoline, and other petroleum products at refineries or elsewhere in the United States at the end of each year for the years 1928, 1929, and 1930, and the holders or owners thereof.

Whether any combination, agreement, understanding, or other relationship exists between corporations, joint-stock companies, or combinations engaged in the oil industry and corporations, joint-stock companies, or combinations, engaged in the operation of pipe lines and

local public utilities, and, if so, the effect of said relationship upon the production and sale of crude oil, gasoline, and other petroleum products in the United States.

The profits of companies refining and marketing petroleum in the United States for the years 1928, 1929, and 1930, and the component elements of said profits.

All other facts as bear upon the recent changes in price of crude oil, gasoline, or other petroleum products or upon any of the foregoing matters. *Committee on Expenses.*

H. J. Res. 497. Mr. Parker (Rep., N. Y.); S. J. Res. 250. Mr. Fess (Rep., Ohio). These resolutions propose an investigation and report by the Interstate Commerce Commission next December as to the effect of pipeline, motor, water and air transportation on railroad revenues, with recommendations for legislation as to governmental regulation of these transportation agencies in competition with steam railroads. *Interstate Commerce.*

PIPE LINE CONTROL

H. R. 16695. Mr. Hoch (Rep., Kans.). This bill would forbid pipe-line companies from owning oil transported by them. *Interstate Commerce.*

S. 5814. Mr. Walsh (Dem., Mont.). This bill would require the Interior Department to issue permits for the construction of pipe lines for the importation into the United States of natural or artificial gas. *Public Lands.*

S. 5297. Mr. Capper (Rep., Kans.). This bill would permit the Gulf Refining Company to maintain not more than 10 pipe lines in the District of Columbia. *Passed by the Senate.*

H. R. 17000. Mr. Zihlman (Rep., Md.). This bill would permit the Griffith-Consumers Company to operate not more than ten pipe lines in the District of Columbia. *Committee on the District of Columbia.*

H. R. 16970. Mr. Howard (Dem., Nebr.). These bills would authorize the Missouri Valley Pipe Line Company of Iowa to operate a pipe line bridge across the Missouri River at Sioux City, Iowa. *Interstate Commerce.*

H. R. 16387. Mr. Hope (Rep., Kans.). This bill would require the marking of imported petroleum and products to show the country of origin, and provides as follows:

"That every container of crude petroleum and of all refined forms thereof and all products thereof which may hereafter be imported into the United States, and containers of all products manufactured therefrom within the United States shall hereafter be conspicuously marked, stamped, branded, or labeled in such manner as to indicate the country of origin of said petroleum, refined form, and product thereof." *Ways and Means.*

S. J. Res. 238. Mr. Shortridge (Rep., Calif.); H. R. 16627. Mr. Hastings (Dem., Okla.), and H. R. 16305. Mr.

Garber (Rep., Okla.). These bills propose duties of \$1 per barrel on crude oil and 50 percent ad valorem on refined products imported into the United States. The resolution was referred to the Senate Committee on Commerce and the House bills to the Committee on Ways and Means.

S. 5818. Mr. Capper (Rep., Kans.); and H. R. 16585. Mr. Garber (Rep., Okla.). These bills would restrict crude oil imports to 16,000,000 barrels per year and forbid the importation of refined products during the next three years. The Senate bill was reported by the Commerce Committee and the House bill was considered by the Ways and Means Committee.

H. J. Res. 470. Mr. Garber (Rep., Okla.). This resolution proposed to authorize the President to lay an embargo on the importation of crude oil and refined products for such period as necessary for the protection of the domestic oil industry. *Ways and Means.*

H. J. Res. 496. Mr. Garber (Rep., Okla.). This resolution proposed to restrict oil imports to not more than 1,500,000 barrels per month nor more than 6,000,000 per year by any one company, and to forbid the importation of refined products during the next three years. *Ways and Means.*

H. R. 16478. Mr. Wurzbach (Rep., Tex.). This bill proposed to restrict annual imports of crude petroleum and products each year beginning in 1932 to 20 percent of the imports in 1930, this restriction to be effective for three years. *Ways and Means.*

S. 6128. Mr. Walsh (Dem., Mont.); and H. R. 16589. Mr. Colton (Rep., Utah.). These bills would amend the leasing law so as to apply the unit development system to oil and gas leases. *Public Lands.*

H. R. 15772. This bill would prevent double taxation on proceeds from mineral leases on lands of the five civilized tribes of Indians in Oklahoma by providing that lessees shall pay an ad valorem tax up to July 1, 1931, and the gross production tax thereafter. *Passed by the House and Senate.*

OIL SHALE

H. R. 15002. Mr. Eaton (Rep., Colo.). This bill is designed to perfect entries to oil shale lands and reads as follows:

"That section 37 of the Mineral Leasing Act be amended by adding the following: Provided that upon July 1, 1932, every oil shale placer mining claim shall be deemed abandoned and forfeited to the United States, except every such claim then included in a pending application for patent and every such claim upon which not less than \$100 worth of labor shall have been performed or improvements made before noon July 1, 1932, and affidavit thereof filed before October 1, 1932, in the Land Office in which such claim is situated. And upon

every claim not so abandoned or forfeited, not less than \$100 worth of labor shall be performed or improvements made before noon, July 1, 1933, and affidavit thereof filed before October 1, 1933, in said Land Office: Provided, however, That in lieu of the said performance of labor or making of improvements, the owner of every such claim may pay to the register of said land office the sum of \$100 within the periods so allowed for performance of labor or making of improvements, and every such payment shall be included in the computation of the five hundred dollars' worth of labor or improvements required as a condition to issuance of patent: Provided, further, That performance of such labor or making of improvements shall not be required upon or for any such claim included in an application for patent, during pendency of such application; in event of rejection of such application or of cancellation of any mineral entry allowed upon such applications, not based upon invalidity of claim, the owner of the claim shall be allowed one full year after such rejection or cancellation within which to perform the labor or make the improvements required, or make payment in lieu thereof, and such performance, improvements, or payment shall continue such claim in good standing until the expiration of such year.

"The acquisition of possessory title to any such claim by an innocent purchaser for a valuable consideration, and without knowledge or notice of fraud or invalidity affecting the location of such claim, shall constitute a complete defense to a charge of lack of substantial interest of any person appearing of record as a locator of the claim.

"Any such claim for which application for patent shall not have been filed on or before July 1, 1934, shall be deemed abandoned and forfeited to the United States without further action, proceeding, or assertion of title by the United States.

"Nothing in this act contained shall be construed as applicable to any mining claim other than oil-shale placer-mining claims." *Reported by House Public Lands Committee.*

H. R. 16464. Mr. Colton (Rep., Utah.). This bill proposes to set aside certain lands in Utah as an addition to the Navajo Indian reservation, but provides that should oil or gas be produced in paying quantities, 37½ percent of the net royalties shall be paid to the State of Utah. *Public Lands.*

H. R. 16345 and 17034. Mr. Britten (Rep., Ill.). These bills provide for a poison label on wood alcohol shipped in interstate commerce. *Interstate Commerce.*

S. 6090. Mr. McKellar (Dem., Tenn.). This bill proposes to safeguard the distribution and sale of anti-freeze articles by marking them as poison and coloring them so that they may not be confused with potable alcohol. *Interstate Commerce.*

S. Res. 437. Mr. Broussard (Dem., La.). This resolution provides as follows:

WHEREAS on June 20, 1930, an interdepartmental conference was held at the

Bureau of Prohibition, Department of the Treasury, for the purpose of ascertaining how public health and life could be better protected from the dangers incidental to the manufacture, distribution, sale, and use of wood alcohol, otherwise known as methanol or methyl alcohol, whether derived from the destructive distillation of wood, synthesis of gases, or other processes; and

WHEREAS as a result of such interdepartmental conference, the Surgeon General of the Bureau of the Public Health Service, Department of the Treasury, was requested to make and did undertake a study of the problem in cooperation with other departments of the Government, but has not completed such study; and

WHEREAS although the Bureau of Mines, Department of Commerce, was represented at such interdepartmental conference and concurred in the result thereof, it published in December, 1930, "Information Circular 6415" pursuant to what is referred to in said publication as a "cooperative agreement" between such Bureau of Mines and certain producers of wood alcohol, otherwise known as methanol or methyl alcohol: Therefore be it

Resolved, That the Secretary of Commerce be directed to forthwith furnish to the Senate of the United States the following:

Copies of all "cooperative" or other agreements and correspondence between the Bureau of Mines, Department of Commerce, and any manufacturer of wood alcohol, otherwise known as methanol or methyl alcohol, together with the names of all officers and agents of the United States concerned with the conception, financing, preparation, publication, and circulation of said "information Circular 6415"; the amount of money paid to the Bureau of Mines, Department of Commerce, or any representative thereof, by any manufacturer of wood alcohol, otherwise known as methanol or methyl alcohol; and any and all other information, facts, and figures bearing upon the subject matter.

IMMIGRATION RESTRICTION

H. J. Res. 473. Mr. Free (Rep., Calif.). This resolution proposes to restrict immigration to 10 percent of those now allowed, to apply from July 1, 1931, to June 30, 1933. *Reported by the Committee on Immigration.*

H. Res. 346. Mr. Johnson (Rep., Wash.). This resolution provides for consideration of the foregoing resolution by the House. *Rules.*

H. J. Res. 500. Mr. Jenkins (Rep., Ohio). This resolution would restrict immigration to 10 percent of those now admitted, effective for two years beginning July 1, 1931. *Immigration.*

H. R. 16296. Mr. Bachmann (Rep., W. Va.). This bill provides for the exclusion and expulsion from the U. S. of alien anarchists or communists. *Immigration.*

S. Res. 305. Mr. Glass

(Dem., Va.). This resolution would forbid the State Department from passing on foreign security issues in the United States. *Reported by the Committee on Banking.*

H. J. Res. 501. Mr. Hill (Dem., Wash.). This resolution would establish a Joint Congressional Committee of members of the Senate and House to investigate damages in the United States by fumes from the smelter of the Consolidated Mining and Smelting Co., at Trail, British Columbia. *Rules.*

H. R. 16249. Mr. Smith (Rep., Idaho.); and H. R. 16976. Mr. Cramton (Rep., Mich.). These bills would provide that power revenues on Federal irrigation projects shall be used in defraying the costs of the power and irrigation projects and the balance turned over to the general reclamation fund. *Irrigation.*

S. 5981. Mr. Phipps (Rep., Colo.). This bill authorizes the sale of surplus power developed under the Grand Valley reclamation project in Colorado. *Reported by Irrigation Committee.*

S. 6134. Mr. Wheeler (Dem., Mont.); and H. R. 17038. Mr. Leavitt (Rep., Mont.). These bills propose that power sites on the Blackfeet Indian reservation in Montana shall be the property of the Blackfeet Indians, who shall receive proceeds from their sale, lease or disposal. *Indian Affairs.*

S. Res. 415. Mr. Walsh (Dem., Mont.). This resolution directs court proceedings in the District of Columbia to determine whether Dr. George Otis Smith, former Director of the Geological Survey, is legally holding office as Chairman of the Federal Power Commission, in view of the fact that the Senate recalled and later rejected his nomination subsequent to his confirmation and taking over the office, as the President declined to send his nomination back to the Senate. *Passed by the Senate.*

H. Res. 340. Mr. Garner (Dem., Tex.). This resolution proposed the discharge

of the present conferees on the Muscle Shoals, Ala., nitrate and power project disposition bill and the appointment of new conferees with the Senate in an effort to finally act on this legislation. *Rules.*

H. R. 16517. Mr. Kendall (Rep., Pa.). This bill would forbid the importation after April 1, 1931, of goods mined, produced, manufactured, transported, handled, loaded or unloaded by convict, forced or indentured labor, except those which are not mined, produced or manufactured in such quantities in the United States as to meet the consumptive demands of the country. In proceedings under the act, reports and depositions of officers of the United States would be admissible as evidence. *Reported by the Ways and Means Committee.*

H. R. 16247. Mr. Wood (Rep., Ind.). This bill would give the United States the power to purchase or lease patents for governmental purposes, at a reasonable price to be determined by a representative of the Government agency desiring to use the patented article, the seller or lessor of the article, and a person appointed by the Secretary of Commerce. *Patents.*

H. R. 16389. Mr. Sinclair (Rep., N. Dak.). This bill would authorize the Federal Trade Commission to hear and punish complaints alleging unfair trade practices, similar to a bill previously introduced by Senator Nye (Rep., N. Dak.). *Judiciary.*

H. R. 16560. Mr. Smith (Dem., W. Va.). This bill would authorize the Navy Department to dispose of the naval ordnance plant at South Charleston, W. Va., because it is no longer needed for the naval service. *Naval Affairs.*

S. Res. 444. Mr. Frazier (Rep., N. Dak.). This bill would establish a Mississippi Engineering Advisory Board of nine members appointed by the President, including an economist and eight civilian engineers, expert in civil, mechanical, hydraulic, dredging, marine construction, lock and dam, structural steel or foundation engineering. The board would investigate and report on projects for control of the Mississippi River. *Commerce.*

S. 454. This bill provides for the appointment by the President of nine persons to investigate and report as to the advisability of establishing a national museum of engineering and industry in Washington, D. C. *Passed by the Senate.*

H. R. 16473. Mr. Hogg (Rep., Ind.). This bill is designed for the relief of unemployment, and provides that no power driven apparatus or machinery shall be used in any excavation required in the construction of public



© Harold Gray

Old water power saw and flour mills near Norbeck, Md.

buildings or works under the Treasury Department for one year. *Public Buildings.*

S. 3060. To establish a national employment system in cooperation with the states. Rule for its consideration by the House has been reported by the Rules Committee.

S. 5776. Mr. Wagner (Dem., N. Y.). This bill would provide for the advance planning and regulated construction of public works to stabilize industry and aid in preventing unemployment during periods of depression. *Enacted into law.*

VALUE CHANGES

S. Res. 425. Mr. Steiwer (Rep., Oreg.). This resolution calls for the appointment by the Vice President of a commission of three persons, not members of the Senate or House, to ascertain the causes of fluctuations in commodity and security values and to suggest remedies either in the form of legislation or otherwise. The commission would consider all factors influencing price relationships and practices which may directly or indirectly depress the prices paid to producers or enhance the prices paid by consumers of food products, including all practices which influence this relationship by affecting credits and the values of securities and commodities. Reported by Committee on Agriculture and Referred to the Committee on Expenses.

S. Res. 430. Mr. LaFollette (Rep., Wis.). This resolution proposed to call on the Department of Labor for a report on the percentage change for each month in the number of employees and the size of pay rolls from June, 1929, to December, 1930, of manufacturing plants employing from 50 to more than 10,000 persons.

S. Res. 435. This resolution proposes a committee of three Senators to study and report by December 7 next on unemployment insurance systems in use by private interests in the United States and by foreign governments, and the relative state, Federal or private responsibility in connection with such systems. Reported by Senate Commerce Committee and referred to Expense Committee.

S. 5625. This bill provides for participation by the Government in the Chicago World's Fair Centennial Celebration in 1933. Passed by the Senate and reported by the House Library Committee.

S. J. Res. 241. Mr. Brookhart (Rep., Iowa.). This resolution proposes to extend the Inland Waterways Corporation service operations to the Ohio River. *Commerce.*

H. R. 12284. This bill provides \$650,000 for the construction of a Coast Guard Cutter for service on Lake Erie in rescuing and assisting vessels in distress. *Reported by Senate Commerce Committee.*

H. R. 16425. Mr. Collins (Dem., Miss.); and S. 5820. Mr. Stephens (Dem., Miss.). These bills would authorize \$25,000,000 for construction loans to railroads. *Interstate Commerce.*

S. 4353. Mr. Connally (Dem., Tex.). This bill authorizes the Orange Car and Steel Co., of Texas, to prosecute in the Court of Claims its suit for \$176,665 in connection with a Government shipbuilding contract. *Passed by Senate.*

S. 4307. This bill provides for the payment by the Commercial Coal Co., of \$7,000 to the District of Columbia as a compromise of a suit of the District for \$19,300 against the company for forfeiture of a contract. *Enacted into law.*

S. 4837. Mr. Hayden (Dem., Ariz.). This bill authorizes the payment of \$515 to the Copper Ridge Mining Co., in connection with purchase money on a mineral entry in the Phoenix land office. *Passed by Senate.*

H. R. 16348. Mr. Eslick (Dem., Tenn.). This bill would forbid the mailing of published or written matter which advocates communistic principles. *Judiciary.*

THE SILVER SITUATION

(From page 138)

The major portion of silver is a by-product of mining operations carried on for some other metal or metals, as for example, silver-lead, silver-gold, silver-copper, silver-zinc, or silver-lead-zinc. There are comparatively few straight silver mines. The production of silver is a rough index of conditions in the nonferrous metal mining industry.

Some one has calculated that a decline in the price of silver to 35 cents would increase the cost of copper 2 cents per pound, of lead 3 cents per pound, and of zinc 1 or 1½ cents per pound. Of course, this is only a general estimate and may not be reliable. The result will be different in each mine, depending upon the proportions of the metals present.

THE best opinion is that the present annual gold production of 20,000,000 ounces can not be maintained beyond 1935, when a slow decrease will probably begin, bringing the output down to 15,000,000 ounces by 1940. Thus an increasing volume of world business and commerce will fall upon a decreasing gold production. More business will have to be done with less money, unless gold is supplemented by another metal. Even if silver were restored to a better monetary position, after providing for the quantities required for industrial purposes, for arts and crafts, and in satisfaction of the constant appetite of China and India, there would be no great volume of silver left to help out the gold situation. The available amount would probably be no more than is neces-

sary to remedy the present drain on gold resources.

There is little or no foundation for the bogey that if silver be revolved in direct ratio to gold the world will be flooded with silver, because, as I have stated, it is principally produced in these days as a by-product of base metal mining. Accounting methods differ, but by-product silver actually affords a credit to set against the cost of producing the base metal with which it is associated, and there would be little incentive to produce greater quantities of lead, zinc, or copper merely for the purpose of recovering more silver.

On the other hand the grade of a complex ore that may be worked at a profit often depends upon the value of its silver content. The higher the price of silver, the lower the grade of the ore that can be worked. Hence high silver means conservation of natural resources and increased employment.

But the central theme of the silver question today is, how far is the drop in silver responsible for the world depression, and to what extent can the depression be relieved by taking steps to raise the price of silver? I repeat that I have not pretended to put forth any original ideas of my own on these questions, but they deserve the careful study of economists, financiers and statesmen.

Comprehensive Study of the World's Coal Industry Published

Increased utilization of other sources of heat and power, together with the attempts of foreign countries to produce as much coal as possible for their own needs are factors which have served to depress the American coal industry.

Improved technological methods of control and combustion, however, make it reasonably certain that coal will continue for some time to come to be our most economical fuel.

Because of the changing status of coal throughout the world and the general interest in this outstanding element in world economy, the Department of Commerce undertook a comprehensive study of the coal situation throughout the world. The results of this study have been embodied in a single volume, "The Coal Industry of the World," which is now ready for distribution.

Besides a general review under the head, "Coal as a World Power," the report presents an analysis of the coal situation in countries, including resources, output, exports, imports, and future possibilities. Especial attention is, of course, devoted to the major coal-producing countries.

Copies may be obtained from any branch office of the Bureau of Foreign and Domestic Commerce or from the Superintendent of Documents, Washington, D. C. Price, \$1.

The relation between TIMBERING and ROOF ACTION

By G. B. Southward

THE difference between the roof action in room and pillar and long face mining requires different methods of supporting the strata over the working face. As has already been discussed in previous articles, in most room and pillar mining the top is held as a beam supported at each end by coal pillars. In long face mining the roof acts as a cantilever overhanging the coal at the working face. By the laws of mechanics, a beam when supported at each end has an effective span four times as long as when it is used as a cantilever. In the second place, the working places in room pillar recovery are not kept open continuously and the roof can break on the solid coal without causing any serious inconvenience or interruption. In long face mining the working face must be kept open continuously and consequently the roof must break or subside at some distance out from the solid coal.

The function of the timbering is therefore quite different in each system. In room and pillar workings the timbers are only to help support the top while the coal is being mined; in long face work the timbers not only have to support the top but in addition have to act as a fulcrum on which to break the roof rock. This latter is by far the severest service which long face timbering is called upon to perform and under many conditions an artificial support is not equal to the task. In such cases the roof will break along the solid coal and close the working face.

Long wall mining is worked successfully and in a number of ways it has distinct advantages over room and pillar mining, particularly where mechanized loading is employed. It is therefore well worth while to study the possibilities of long face work and to determine if possible the conditions under which this method of mining can be expected to succeed and where not. The roof action is, of course, the governing factor and this article will discuss the effectiveness of timbering under different types of roof conditions.

When complete mining is made over a large area, the strata over the coal is affected to some degree from the seam

clear up to the surface. The action of the overburden has an affect on the roof at the coal face, but in the first analysis the character of the strata immediately over the coal really determines the type of roof support needed. It will therefore be the purpose of this article to consider only the action of the roof rock without taking into account the pressures and weights caused by the overlying cover.

The roof action can be divided into two general classes: (1) bending and subsiding, and (2) breaking or caving. Both are used successfully as well as un-

Roof action is governed more by the character of the top than by the method of timbering.

successfully and Figures 1 to 5 illustrate typical conditions which are encountered. Figures 1 and 2 illustrate the bending and subsiding principle while Figures 3, 4 and 5 illustrate the breaking and caving action.

Figure 1 shows the use of packwalls as a roof support for a rock which has sufficient flexibility to bend without breaking. In this type of mining packwalls serve two purposes—First, to support the top after it has bent down for a short distance to rest on the walls and, second, to retard the movement from there on so that the point where the roof and pavement come together is quite a distance away from the solid coal face. This, of course, flattens the bending curve. It also frequently happens that the packs are pressed down into the bottom strata which results in forcing or squeezing the bottom upward so that the actual point of meeting is higher than the original mine floor. This further flattens the bending curve.

Figure 2 shows the effect of substituting timbers for the packwalls and shows why this type of support is not correct for the bending and subsiding action. As the roof subsidence increases back from the face, the point is soon reached where the timbers are crushed and when this occurs the roof is, of course, without any support. Consequently there is

nothing back of the face to retard the subsidence movement other than the strength of the rock itself. This causes the roof to make a much sharper bend than it would with the support of packwalls and as a consequence the limit of flexibility of the rock is apt to be exceeded before complete subsidence is reached and the roof breaks on the coal.

A comparison between Figures 1 and 2 shows that packwalls have two points of superiority over the timbers and either of these two may be essential to success. The packwalls cause the roof over the coal face to act as a beam supported at each end and the length of this beam is comparatively short. With timbers, the roof acts more as a cantilever, but if it does bend to the point of resting on the pavement, its unsupported span length is much greater than in Figure 1. The bending curvature is also much greater where the timbers are used. These sketches illustrate why the substitution of timbers for the long wall packs has resulted in many roof failures.

Cribs are sometimes substituted successfully for packwalls. Their action is the same as packs in that their effectiveness increases with the subsidence pressure. However, under very heavy cover or under conditions where very heavy roof weights occur the cribs may not be sufficient to bring about the desired subsidence movement as they are inferior to packwalls in crushing strength and in supporting area.

Figure 3 shows the caving system applied where a thick strong strata forms the roof of the seam. Under such a condition it is difficult to imagine any artificial support of sufficient strength to form a breaking fulcrum out from the face of the solid coal. Cribs might have the required strength, but their compressibility before this strength is reached is apt to cause a fracture by bending at the face of the coal.

Figure 4 shows a strong roof strata but of such strength and thickness that an artificial break line will work. The break line, however, must not be very compressible, otherwise the roof is apt to bend at the coal face and a plane of weakness will develop as shown in the sketch. This will cause a subsequent fall along the working face when the next cut is taken out. A roof of this kind requires a strong rigid support. Heavy timbering may prove satisfactory but steel jacks have been very successful.

Figure 5 shows a comparatively weak top but yet strong enough to span short distances without cross barring. Under a condition of this kind the cave will break on artificial support—at least it is said to be broken by the support. Actually, however, it is more frequently true that the timbers are holding the

Sketches Showing Roof Action in Long Face Mining

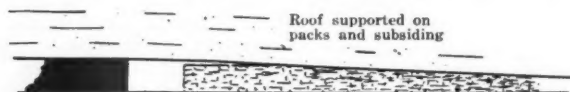


FIGURE 1
Roof subsiding on packwalls



FIGURE 2
Roof subsiding on timber supports

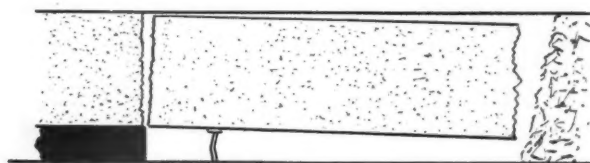


FIGURE 3
Roof caving with timber supports
under heavy strong top

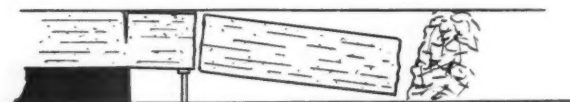


FIGURE 4
Roof caving with timber supports
under medium strong top



FIGURE 5
Roof caving with timber supports
under weak or brittle top

strata in place and when they are removed the top falls by its own weight. In other words, the timbers do not break the top in the same sense as Figure 4; they merely hold the top and under such a condition the fall can be had at almost any point desired.

It is generally found that the caving principle on a long face is more apt to have successful roof breaks where the falls will occur at short intervals—in some cases as soon as every cut advances. This implies a weak roof which is barely self-sustaining and is ready to fall as soon as the supports are removed. A stronger rock which will overhang some distance out from the face without any support presents greater difficulty in breaking on timbers or jacks.

The sketches in Figures 3, 4 and 5 are not submitted as representing every condition encountered in long face mining. As will be seen, the mine roof which breaks or caves is shown to be of uniform character and thickness. This is done merely for convenience in illustrating the principles involved. In actual mining conditions the roof which breaks during the primary falls may be composed of several strata which are all different from each other. The sketches further show the roof in Figures 3 and 4 acting as a cantilever beam and failing by bending stresses. In actual practice the break may occur by shearing but even so the failure of the artificial support would result in the roof breaking about as shown. The purpose of the sketches, therefore, is merely to illustrate the timber effect under the three broad general classifications of strong, medium and weak top.

These sketches and the foregoing discussion do not take into account the effect of the weight from the general overburden, but consider that the only pressure involved comes from the weight of the roof rock itself. This again is not in strict accordance with actual conditions, but for the sake of simplicity we can consider the manner in which the breaks occur without analyzing all of their causes—particularly in this discussion which is confined entirely to methods of supporting the rock immediately over the coal.

All of this discussion is to emphasize that the roof action is determined more by the nature of the strata than by the method of timbering and that it is wrong to expect the roof support to be more than supplementary. There have been many failures and much money uselessly spent in trying to bring about a roof action and in using methods of roof support which were not in accordance with natural characteristics of the strata.

NOTE: Further discussions on roof action will be presented in a subsequent report.

PRACTICAL OPERATING MEN'S DEPARTMENT



COAL

NEWELL G. ALFORD

Editor

Practical Operating Problems
of the Coal Mining Industry



The FOREMAN— Manager and Teacher

By Hugh Wright*



An attractive bulletin board on the public square pictures high spots in the day's news and keeps everyone up to date on accident statistics

THREE traveling men were holding a chinfest in a Pullman smoking room. I got on at Charleston, W. Va., in time to hear one of them regaling his fellow travelers with an extremely lurid tale:

"I was down in Minetown, one day last summer," he said. "There was a celebration going on. 'Safety Day' they called it, but my great grandfather never ran any more risk in the days he rode with Morgan's raiders. Wasn't I glad to get out of that town all together!"

Certain mine operators, and industrialists as well, have been bold enough to express the sentiment that "Safety is a lot of bunk." Enthusiasts on the other side of the fence throw up their hands, appalled at such obvious lack of foresight. "Safety," they indignantly declaim, "and production go hand in hand. If you call that 'bunk,' it's an indication of how far behind you really are."

A careful scrutiny of past experience would probably reveal that there are substantiating arguments on both sides. If we were to frankly and honestly X-ray our own safety experience, our methods, our campaigns, our safety days, we might reluctantly consent at least, to a modification of the conservative viewpoint and admit there "has been a lot of bunk in safety."

Such an admission might be damaging to our pride, but even so, there would be nothing to feel downcast over. A glance in retrospect at the history of the organized safety movement would reveal three distinct eras or cycles.

The first of these three periods might be captioned "Guarding Machinery." It was largely a child of the drafting room, and its effect upon accident prevention was marked, but limited.

The trend of human thought and experience then led us into the "exhortive period." The orator swung into action; a regular snowstorm of safety signs including that good old time-worn slogan

"Safety First" plastered the works; the parades, headed by "old man Accident," trooped by. It was a time when we enthusiastically preached enthusiasm; we stirred the depths of human emotions. It was in this period, too, that the term "safety engineer" originated. In many respects the title was a misnomer, for the safety engineer was apt to be more of an evangelist than an engineer. This is historical, and not satirical, for accidents were greatly reduced during this period. Many ideas were evolved, which, though not applied as constructively as possible, are the backbone of present-day safety and training work. For example, everywhere one heard the expression "safety education," "educate the man to

* Staff Supervisor of Personnel Publications, The American Rolling Mill Co., Middletown, Ohio.

be safe." Actually, little constructive training, or educating was done.

Another cycle is now under way. To all of us who are engaged in present-day safety or training work, the methods engaged seem highly constructive, and promise permanent and lasting benefits. Twenty years hence, our successors may be more enlightened, and therefore caustic and critical of our methods. Management, and those engaged actively in personnel activities, are now applying the thought expressed many years ago, with one slight variation—instead of "educating" folks to be safe workers, they are "training" them. They perceive the potential profits obtainable when the real essence of the old axiom that "safety and production go hand in hand" is vigorously applied. Some go further than that—they state that experience has proved to them that training the worker to do his job efficiently, to do every operation skillfully, will avoid accidents to a degree greater than anything previously used.

In 1929, The American Rolling Mill Company, of Middletown, Ohio, manufacturers of iron and steel sheets, after many years in accident prevention work, became somewhat dissatisfied, feeling that we had gone about as far as possible under the old methods. In response to this feeling of dissatisfaction, a program of "foreman-manager training" was developed. Its initial concern, is to train the supervision, and, in turn, the supervision trains the workers. Accident prevention is only one of its component parts—not a separate entity—on the premise that when you train the workers to do each operation right, you are preventing accidents.

"That's all right for your steel mills," commented one of our friends in the coal industry, "but what about your mines?"

"Fundamentals in mining and in steel aren't so far apart," was the reply. "If it will work in the steel plant, it will work in the mine, if applied with common sense."

At Nellis, W. Va., where Armco's mines are located, foreman-manager training was applied with pleasing results. Costs have dropped, tonnage per man-hour increased, and accidents have hit the toboggan.

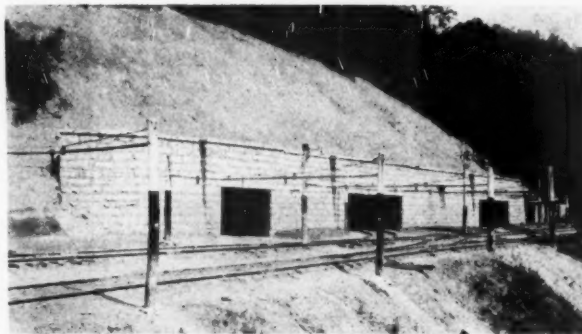
"Once we stopped regarding safety as something separate from production, and began to train men to do their jobs right, our accident experience began to improve by leaps and bounds," stated Charles W. Connor, general superintendent. "The more you reduce mistakes in workmanship the more you reduce accidents."

How sincerely Nellis workers are taking their efforts to be better and safer workmen can be shown by the following actual occurrence:

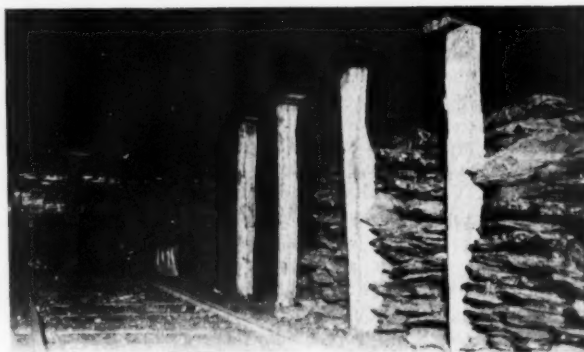
An inspector was watching a man



View of the Armeo Mine taken from the coal cleaning plant



The portal—a silent invitation to be clean and orderly inside



Cleanliness and order—and safe timbering

wedge a prop. "That's good enough," he observed.

"Like H—, it is," shot back the man, "Bill Jayne (mine foreman) showed me how he wanted wedges set." Decide for yourself if the supervision did a substantial job in training that man. It is these little evidences of jobs done right, all over the mine, that are responsible for Nellis' tripple record in costs, production, and accidents.

The most outstanding thing about the training program which has been responsible for bringing this condition about, is its simplicity.

It isn't a text-book program at all; it isn't designed to educate a man, but to make him a more skillful workman; because of its simplicity and understandability, it doesn't scare men off—it makes them want more.

Before discussing the mechanics of foreman-manager training it is first necessary to understand where the responsibility for training men is placed. In Armco steel plants, the works manager is charged with that responsibility, in the belief that he succeeds or fails according to his ability to train men. The same policy applies to Armco's mining opera-



Above—Mine Rescue Equipment



Shops and dispensary at the mouth



An exhibit used to show job training classes the right and wrong of timbering

tions. The responsibility for training mine workers is the general superintendent's, delegated of course, to his subordinates.

Of course, the company maintains a headquarters safety and training staff at Middletown, Ohio, but this in no way interferes with the company policy for responsibility. The man who is responsible for the productiveness of the worker is responsible for training them to be better and safer producers.

Foreman-manager training concerns itself mainly with training the supervisors so that, in addition to the attendant by-

products of such training, the supervisors will be capable of training their own men. Foreman-manager training is founded upon three logical premises:

The first of these is that the foreman is a manager; to do his job effectively he must have the managerial viewpoint. Second, as a manager his efforts should be directed at lowering the costs of production. Third, the most important factor in decreasing costs is the utmost conservation of all of the company's resources within his domain.

It is a six months' program. One month is devoted to the study of a major

subject, and this, in turn, is broken down into four related weekly subjects. The major heads are as follows:

Month

- October The Conservation of Labor
- November .. Machinery and equipment
- December .. Materials and supplies
- January ... Accidents and illness wastes
- February .. Steam, oil, electricity, air, water, etc.
- March..... Cleanliness and order

An analysis of each of these subjects will reveal how completely they cover the field of managerial worries. Take "labor" as an example. One week's work was devoted to "idleness," another to "poor workmanship," another to "labor turnover." The fourth week, as was the case in every instance, was devoted to the cost aspect of the particular subject under discussion.

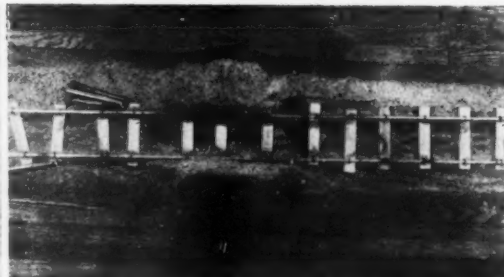
Emphasis was placed on the practical application of the information gained, rather than the accumulation of a fund of academic knowledge.

Blanket outlines were written and distributed by the safety and training staff, to the different works and the mines. Since they dealt largely with fundamentals the general superintendent had but to adapt them to problems incident to mining operations. Once each week he called together his supervisory group, and they discussed how to overcome operating difficulties the outlines suggested. Many valuable and important decisions were made at these meetings, many of them originating with the foremen. More than that, everyone agreed upon the standard methods of performing the different operations. Thus the superintendent, or the mine foreman in their check-ups had an air-tight weapon at their disposal. If a section did not come up to the standards, the section foreman had no excuses for he had absolutely agreed upon the standards.

In these discussions, everything was started in its primary stages and traced through in logical order. No man's information was taken for granted.

In the industrial system, the foreman is the boss, the company to the men. His word is law. All things spring from him. Consequently the placing of the responsibility for training in his hands has a wholesome influence far greater than importing outside instructors. Job training, or training the workers in the technique of mining, is the next step in Armco's program, and logically complements supervision training. However, not a step was taken until after the supervision had been thoroughly trained, and standard methods agreed upon.

No other industry contains so many "all-round" men, or jack-of-all-trades as coal mining. When the average man goes after a job, he usually is doubtful



Gas is not considered a hazard at the Armco Mine, yet electric lamps (left) have been adopted as standard equipment. To the right is a miniature track used in teaching Armco miners how track should, and should not, be laid and maintained

as to the kind of work available. Consequently the standard reply to the question of occupation is "I can do anything about a mine." Everyone will agree that it requires more than the ability to shovel coal to make a real coal loader, just as it takes more to make an expert track man than the mere ability to bolt rails together.

In short, the purpose of job training is to teach the average worker to become an expert worker. Job training is simply training in the standard, accepted methods of performing each operation, either in so-called "production," maintenance, or "dead work." These classes are fundamentally designed to:

1. Train groups on the particular duties of any job.
2. Encourage and exchange of ideas and methods, and improve the individual viewpoint.
3. Establish standard practices among men doing similar work, and thus secure closer coordination.
4. Provide a simple means to check up on the weak points of job knowledge.

The man whom the inspector advised had set his wedge "good enough" knew his job training.

When the groups were assembled, care was taken that they not be too large. The men were divided according to occupation, and the following list of groups were trained: Loaders, machine men, track men, motor crews, rock drillers, track cleaners, slatemen, pumpmen, wiremen, electricians, tippie crews, and janitors. Sometimes the classes were held in the mine; if this was not possible small models or sketches were used.

The details of each course are so voluminous that they can not be published. For that reason, let's take one group—motor haulage. It is regarded as one of the most hazardous jobs in any mine. In the past 19 months there has not been a single lost-time accident at Nellis due to motor haulage. Here is the material used in training the motor haulage group:

1. Daily inspection to be made of motor and equipment and report made at once

to chief electrician on necessary repairs.

2. Sand boxes are to be kept filled and sand pipes kept free from obstructions.

3. When necessary to clean sand pipes, motor must be brought to a stop before beginning to clean; never lean out over side of moving motor to do this.

4. When oiling or greasing motors be sure you put grease on moving parts; use sufficient at proper place, but do not waste by carelessly greasing or oiling.

5. Keep your motor clean. Do not carry unnecessary equipment on motor. Oil and grease daily.

6. Bare or worn places on cable must be repaired at once; no patching permitted. When you can't make necessary repairs send for electrician.

7. Motor must never be operated with trolley pole ahead; change pole as you change direction of travel.

8. Man-trips must be run at a reasonable rate of speed in order to insure the safety of the men, and no person, or persons, shall jump on or off such trip while it is in motion. Brakemen must ride the rear end of trip.

9. Men must sit on side opposite wire in man-trip cars.

10. In gathering of coal on room entries only half of the places are to be "pulled." While empty cars are "placed" in the other half; this method is continued at all times.

11. Never use a room for switching or shunting of cars.

12. All cars, either loaded or empty, must be made secure by the brakemen who will either "scotch" or "sprag" the trip before cutting motor loose from same.

13. Red light is to be carried on rear end of main line trips; all motors must be provided with a headlight.

14. Brakemen shall open all derails as soon as trip passes through.

15. Switch throw lever is to be left in the "flat" position to avoid tripping hazard.

16. Empty cars are to be placed at location desired by the loader and shall not be uncoupled from the motor until same

have been severed, either by a "scotch" or "sprag" or both if necessary.

17. Cars containing posts and caps are to be placed at point of unloading desired by loader in rooms which are advancing; in pillars the cars with posts will be placed between the point where turn rails are laid into the pillar face and the outby break-through.

18. When a car containing posts is taken into a working place an additional empty car must be left at the face for loading of coal, and post car is to be "spotted" at point of unloading.

19. Coupling is to be made after cars strike; hands and feet must be kept away from links while trip is in motion.

20. Brakemen must see that every link and pin is in proper position to prevent trips breaking in two.

21. After making a coupling the brakeman must step back in the "clear" before giving a signal to move trip.

22. In rooms brakeman must never get between car and posts to couple or uncouple his trip. Avoid walking between posts and cars.

23. Motor brakeman is required to use a police whistle for signaling the motorman in all trip movements; either to start or stop, and no other signal shall be considered by the motorman.

24. One blast of the whistle is to "stop"; two blasts to "start"; and three blasts to "back up."

25. Brakeman must examine wheels for "scotches" or "sprags" and remove same before giving signal to start.

26. Motorman shall not start a trip unless the signal is properly given and clearly understood.

27. In gathering of loads the brakeman must ride in the place provided on motor. Riding on front end of loaded car or between cars is prohibited.

28. Motor crews must wear approved shoes and loose clothing is not permissible.

29. Motorman must proceed with "caution" when a new brakeman is on the job.

The remaining classes are similar in effect to this one. Whenever possible small models were used for visualization purposes; sometimes the discussions were held in the mine itself. Every worker at Nellis has been job trained.

Between July 22, 1930, and January 19, 1931, Nellis had a clear record. In 1930, Nellis averaged five-day operation per week. During the year, Nellis had but seven lost-time accidents, a 59 percent decrease over 1929—and this in spite of a tender top and the fact that 65 percent of its coal was pillar coal.

One of the ancient superstitions of mining is "that miners are different." Fortunately that supposition is rapidly fading away, because operators realize that it was a (Continued on page 152)

IN the fall of 1927 the O'Gara Coal Company, operating seven mines in Saline County, Ill., realizing that it was experiencing too many accidents in the production of coal, decided to organize a very complete accident prevention and safety campaign.

Two methods of organization were considered—first, the installation of a safety department entirely separate from the producing department, which would devote its entire time and activities to accident prevention work; and, second, to make the production department, in addition to its producing activities, also the safety department, thus holding the entire operating organization directly responsible for the accident prevention work.

A great deal might be said regarding the merits of either plan. A number of the larger coal companies have adopted the policy of maintaining a separate safety department, which reports its investigations and recommendations direct to the vice president or the general manager, rather than to the general superintendent in charge of operations only. This method has certain definite advantages, in that the safety department is entirely free to make any investigations and recommendations it may see fit without reference to or consultation with the producing department. Too often, however, this method may lead to a lack of cooperation between the safety and producing departments. It has been our feeling that the producing department is responsible for accident prevention, and in our case, our entire operating department constitutes our safety department.

It is generally conceded that the success of any safety program is largely dependent upon careful and detailed supervision of all activities in and around the producing properties, and that, in order to procure this type of supervision, it is essential to have the hearty cooperation of everyone in the organization from the highest official to the trapper boys. To foster cooperation and create an interest in safety, practically every employe of the company was given a first-aid course, through the cooperation of the United States Bureau of Mines, the Department of Mines and Minerals of Illinois, and the United Mine Workers of America.

It was very gratifying to note the interest displayed by the men in connection with this first-aid course. Classes of 50 were first organized and handled by one instructor. It was found necessary, however, to reduce the number in each class to 25, and with over 2,000 men to train, this program extended through

SAFETY ORGANIZATION FOR LARGE MINING COMPANIES



By Carl T. Hayden*

most of the winter months of 1927 and 1928.

The results of this course in first-aid were three-fold; first, it gave the employes a conception of the seriousness of minor injuries if not properly taken care of; second, it fitted them to perform simple first-aid service; and, third, it created the proper basis on which to build an aggressive accident prevention campaign in the mines.

In order to study the progress made in our accident prevention work, a monthly accident report is compiled in the general manager's office, analyzing all accidents, first, on the basis of employment; and, second, on the basis of causes. It further contains a statement showing, for each foreman, the number of accidents to men under his supervision for the month; the number of man-days worked under his supervision; the number of man-days lost, due to accidents, by employes under his supervision; also his rating, which is determined by dividing the number of man-days worked under his supervision by the number of man-days worked, plus the number of man-days lost. The report also contains a statement of the tons produced, per accident at each mine, and a discussion covering the month's experience.

Each foreman is furnished a copy of this monthly accident report for his information and study. He has an opportunity, through this report, to compare the results obtained under his supervision with the results secured by all other foremen at the various mines. Very keen competition has developed between the various foremen to secure the very best possible rating every month.

In order to stimulate this competition and to compensate the various foremen on the basis of the results secured in accident prevention, a monthly bonus plan has been devised. This provides that

each foreman be credited with one cent for every manshift worked under his supervision during the month, and charged one dollar for each man-day lost during the month, due to accidents. We have had foremen with over 3,000 manshifts worked under their supervision without a man-day lost due to accidents within the month. These records result in a very substantial monthly bonus.

When accidents affect the individual foreman's pay envelope, he becomes keenly interested—first, in the prevention of accidents; second, in seeing that accidental injuries have the proper first-aid and medical attention; and, third, the injured man is again at work at the earliest opportunity.

Because of this accident report, it is relatively easy to supervise the activities of the various foremen, as each month's results are clearly set forth and the failure of any individual or the marked success of another is readily noted.

Once a safety program is installed and the entire organization is sold on its results, it becomes very largely self-sustaining. It is, however, necessary to maintain a constant interest which, with the other methods, is achieved by the use of safety bulletins. For a number of years there has been on the market certain illustrated bulletin services, consisting of pictures of current events, and inspiration, messages from leading men throughout the country with a safety message. All of these are very desirable. We have been fortunate enough to develop, in the ranks of the miners' organization, an employe who prepares our own safety bulletins.

The fact that this man is one of our own organization (a top man at one of our mines) adds a personal touch to this service. There is the further advantage in that he is able to prepare any type of bulletin that we may desire to com-

* General Manager, O'Gara Coal Company, Chicago, Ill.

Presented before Mining Section, National Safety Council, Pittsburgh, Pa., October, 1930.

bat accidents from any particular cause. A number of these bulletins are on display; they cover a wide range of subjects.

Payroll inserts—both the bought and home-made—have been used from time to time in an effort to carry the safety idea to the individual miner and, if possible, to his family at home.

We hold safety meetings at quite regular intervals. They are attended by the supervisory force of our company, I invite representatives of other operating companies within the field, and also certain leading citizens from the immediate community. These men usually give short talks on the safety work carried on by their particular companies, which has a tendency to give our organization something new, or at least the same story from a different viewpoint.

In giving the first-aid training to practically all of our employees, a number of men became particularly proficient and displayed a keen interest to further increase their knowledge and training. To maintain interest in accident prevention and better train these particular men, an inter-company first-aid meet is usually held during the summer months, the winning team being sent to the International First-Aid Meet. It has been our policy, in addition, to hold a mid-winter O'Gara First-Aid Meet, in which compete, not only men from our own organization, but boy scout first-aid teams that have been trained by our own men—the boy scouts carry the idea of safety to the home and to the community.

Summarizing, it has been the policy of the O'Gara Coal Company, first, to sell the entire organization, from the highest official to the lowest employe, on the idea of accident prevention; second, to enlist the hearty cooperation of every employe; third, to place the responsibility for accident elimination on every foreman in the operating department; fourth, to analyze in detail at regular intervals, the results procured by these foremen; fifth, to maintain a constant interest in accident prevention not only at the mines and during the hours at work but also through the entire community.

The exact results of this safety program are difficult to measure. There has been a number of satisfactory accomplishments; during the ten-year period prior to the installation of this safety program, this company produced approximately 300,000 tons per fatality, but since this program has been in operation, the last three years, over 800,000 tons of coal have been produced per fatal accident.

We were able to operate from November 30, 1927, to February 26, 1929, without a fatal accident, for which we were awarded a Joseph A. Holmes Association certificate. During this period we produced 1,850,777 tons. We also operated

from March 27, 1927, to September 21, 1929, without a fatal accident due to "fall of rock or coal," and during this latter period produced 2,735,551 tons of coal. These results have been accomplished only by the hearty cooperation of our entire operating department.

THE FOREMAN

(From page 150)

|| bed-time story in the first place. Many miners haven't been in the mining business all their lives. Some of them are ex-farmers, some have worked in steel plants, in canneries, in construction, or in any of a multitude of vocations. They enjoy just as much satisfaction and pride in their workmanship as any industrial worker. Sometimes they are ignorant of the best methods for doing the job, sometimes they doubt the sincerity of the management or supervision, as do countless other workers. They can be trained to work efficiently and well; they can be trained to work safely as the imposing safety record at the Armco mine will reveal.

CONCENTRATION OF IRON ORES

Iron ore is a relatively cheap commodity and, if an iron-mining operation is to be successful economically, no great amount of money can be spent in its concentration. In many instances, however, the question of cost of a concentration method has been unduly emphasized, with the result that poor milling methods are frequently tolerated solely because they are cheap.

A study of milling operations in the Mesabi district of Minnesota, undertaken by the Mississippi Valley Experiment Station of the United States Bureau of Mines, in cooperation with the Missouri School of Mines and Metallurgy at Rolla, Mo., has brought out this point clearly. At two of the plants in this district a low cost process is being used to treat a sandy bowl classifier rake product. The tenor of the feed is approximately 53 percent of iron and 19 percent of silica, and from it are produced concentrates containing about 57 percent of iron and from 12.5 to 14.0 percent of silica. The tailings contain from 45 to 50 percent of iron. Experimental work at Rolla has demonstrated that these tailings can be efficiently tabled if they are first hydraulically classified and that higher grade concentrates can be produced than were made by the existing units working on the new and richer feed. The table tests have shown that concentrates containing from 61.5 to 63.0 percent of iron can be produced from the tailing and that by using tables to clean up the tailings from the existing units an overall recovery of over 92 percent of the total iron coming to these units can be made. As a result of this experimental work one of the companies in the

Mesabi district is at present drawing up plans for three tabling plants to treat the tailings mentioned and also sludge basin material.

FERROMANGANESE FROM MANGANIFEROUS IRON ORES

There is a wide difference of opinion as to the degree of our dependence upon imported ferro-grade manganese ore. Unsettled conditions in countries from which the United States is obtaining most of its ferro-grade manganese ores have recently aroused more interest in the question. The North Central station of the Bureau of Mines, in cooperation with the University of Minnesota, has developed during the course of several years of experimentation a three-step process for making ferromanganese from Minnesota maganiferous iron ores, which occur in large tonnages. The first step of smelting the ores to produce spiegel has been proven feasible by tests with a six-ton blast furnace. The second step of treating the spiegel to separate the manganese from the iron and phosphorous has been tested experimentally in a half-ton open-hearth furnace and a small arc electric furnace. Slag, containing about 50 percent manganese and amounts of iron and phosphorus that will meet the requirements of ferro ores, has been produced in the second step. The final step of making ferromanganese from two types of high-manganese slag, both of which can be produced in step (2), will be investigated in the experimental blast-furnace tests for which preparations are under way.

PRODUCERS AND CONSUMERS OF DOMESTIC MANGANESE ORES

A partial list of the producers and consumers of domestic metallurgical and chemical manganese ore (35 percent plus, manganese content) has been published by the Bureau of Mines. The list gives the names of 37 producers of manganese ores operating in the states of Arizona, Arkansas, California, Georgia, Idaho, Montana, New Mexico, Tennessee, Texas, Utah and Virginia during 1929.

Lists of consumers of domestic high-grade metallurgical ores and of consumers of domestic chemical ores are also given. Copies of this list may be obtained from the Bureau of Mines.

The organization of a technical committee to establish standard specifications for sieves for testing purposes, under the auspices of the American Standards Association, has been requested by the American Society for Testing materials. The society proposes to offer, as a working basis, the specifications on this subject, which were developed in cooperation with the Bureau of Standards in 1926.

PRACTICAL OPERATING MEN'S DEPARTMENT

METALS

GUY N. BJORGE
Editor

Practical Operating Problems
of the Metal Mining Industry



STEEL TUNNEL SUPPORTS

at Anaconda's Phosphate Mine

By E. M. Norris*



AT the Anaconda Copper Mining Company's phosphate property at Conda, in the southeast corner of Idaho, a crosscut tunnel is being driven under the Aspen Range to develop a phosphate bed lying on the eastern slope of the range. The tunnel is 9 ft. wide by 10 ft. high inside of timbers, and will be about 8,200 ft. long when completed.

During the summer of 1928 the tunnel penetrated some steeply dipping sandstone beds which were saturated with water. The face of the tunnel was then 7,300 ft. from the portal and 950 ft. below the surface of the overlying moun-

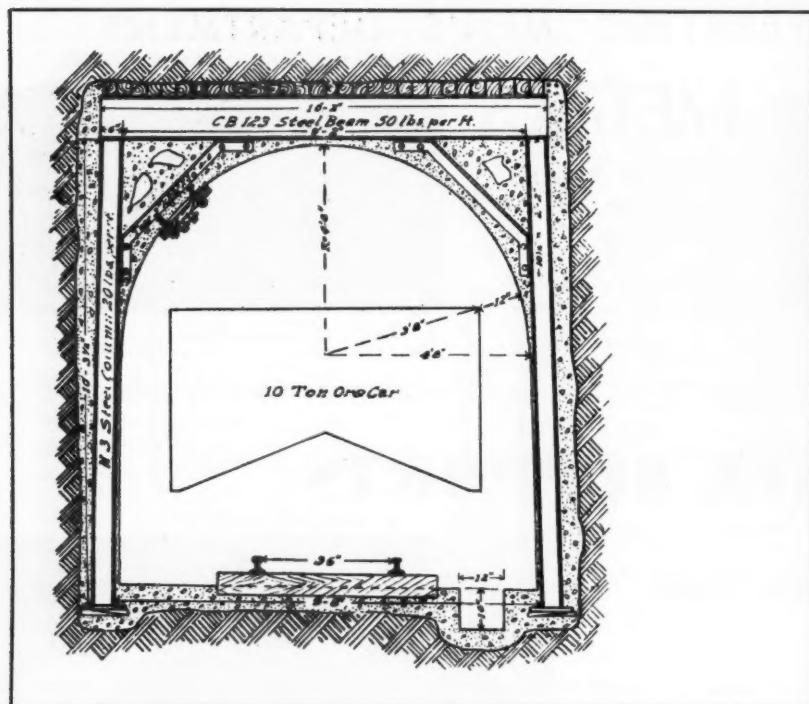
tain. The hydrostatic head of water, estimated at 300 ft., caused the loosely consolidated sandstone to flow readily. Progress through this formation by spiling and breastboarding was made with great difficulty after small drainage crosscuts had been driven to partially reduce the water pressure. The Douglas fir timbers, 10 x 14 in. caps and 10 x 10 in. posts, placed at 2.5-ft. centers, failed to hold the overhead weight, and it was necessary to reinforce them with 10 x 14 in. timbers placed skin to skin inside of the standard set.

After crosscutting through 98 ft. of this formation hard limestone was reached. In the meantime, the doubled-

up timbers were showing signs of failure, due to the great overhead weight.

The combined weight of the overlying sandstone and the water pressure was sufficient to crack the 28-in. overhead beams on an 8-ft. span. It was therefore evident that a stronger form of support must be used. After consultation with Carnegie Steel Company engineers a structural steel set, strong enough to carry a 40-ton overhead load, was designed to replace the timber sets (see accompanying drawing). Each set consisted of an overhead horizontal beam or cap of I-beam section 12 in. deep by 10 ft. 2 in. long, weighing 508 pounds; two posts of H section 6 in. deep by 10 ft.

* Superintendent, Anaconda Copper Mining Company.



3.5 in. long, weighing 210 pounds each; and two knee braces built up of angle iron 3 x 2.5 x $\frac{3}{8}$ in., bent to shape and riveted together by their 3-in. legs. The posts were provided with angle iron brackets at the top for bolting to the overhead I beam and the bottoms were shod with heavy, steel-bearing plates. The knee braces were secured in place between the cap and posts by bolts. The sets were spaced and braced laterally by four $\frac{3}{4}$ -in. tie rods threaded and with two nuts on each end. Two of these rods were placed horizontally between the beams and two between the posts.

Twenty-seven of these sets were to be placed at 5-ft. centers; three sets in the heaviest portion at 2.5-ft. centers.

It was necessary to use great care in removing the wooden timbers because of the heavy ground pressure and the tendency of the sandstone to run through any opening in the spiling. In preparation for the replacement false sets were jacked up against the overhead spiling on either side of the set to be removed. The old timbers and sills were cut out and a concrete footing about 20 in. square by 8 in. thick was poured on rock bottom to give a firm foundation for the steel posts. During the three-day interval necessary for the cement to become firm other sets were removed and the footings prepared. When the cement bases had hardened, the steel timbers were placed in position. They were leveled and blocked with steel wedges. After five sets had been placed and all of the old timbers removed, grouting

was poured about the base of the steel posts. The track, ties and ballast were taken up and concrete poured over the bottom of the crosscut to a depth of 8 in. A drainage ditch was provided for on the south side and the treated timber track ties were set about 2 in. into the concrete. The photograph shows the crosscut as it looked after the steel sets had been placed and bottom concreted.

The roof of the crosscut was now held in place by wooden spiling resting upon the steel caps. The sides were held by wooden spiling and lagging, which were blocked back from the steel posts by old tee rails and iron wedges. The sandstone beds were producing a steady flow (about 400 g. p. m.) of water, which had a high lime content and was not corrosive to the steel sets. It was decided to put a permanent lining in this section of the tunnel by placing concrete in an arched section (see drawing).

One-inch steel reinforcing rods were placed around the circumference of the arch and sides at 2-ft. intervals. A 1-2 $\frac{1}{2}$ -4 concrete with 0.7 water ratio was given a five-minute mix in a small, portable, electrically driven mixer. The concrete was placed by hand on the sides and as much of the arch as was possible. Large limestone boulders were used to fill up the upper corners between sets.

The top portion of the arch was shot in place with a cement gun using a 1-3 mix. The air temperature was 46° F., water temperature 40° F. After three months' curing the concrete gave a

crushing strength of 5,310 pounds per square inch. It was necessary to cement iron drain pipes into some of the larger water fissures before placing the concrete lining in order to prevent washing the cement. Drain pipes were placed through the concrete on both sides at 5-ft. intervals. A few small leaks in the concrete, which were discovered when the forms were taken off, were closed up with the cement gun. At both ends the concrete lining was tied into hard rock by carrying it into flaring hitches cut into the limestone. After two years of service the design appears to be entirely satisfactory. The steel sets have also been used without the concrete lining on sides and roof where short sections of heavy ground have been encountered further along in this crosscut.

Standard Dimensions for Keys and Keyways

American standard dimensions for Woodruff keys, keyways, and cutters have been approved by the American Standards Association following submittal by the American Society of Mechanical Engineers, which is in charge of the technical committee on this project. The intensive study given to this standard during its development appears to assure its meeting the needs of industry.

The standard covers a series of 27 keys of various thicknesses having radii of curvatures ranging from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch. This series is said to cover 90 percent of the requirements of the entire consuming industry. A simplified method of indicating Woodruff key sizes has been incorporated in the standard.

Zinc Coating Standards Approved

The American Tentative Standard, Zinc Coatings on Structural Steel Shapes, Plates, and Bars and their Products has been approved by the American Standards Association.

The standard was submitted for approval by the American Society for Testing Materials, as a revision of a previous standard. It includes designations of specific grades of structural steel, grades of galvanizing spelter bath, maximum amount of impurities allowed in the molten zinc bath, specifications for steel embrittlement, weight of zinc coating, and a test for uniformity of zinc coating.

The standard departs from the previous issue in no longer designating specific grades of structural steel but permitting instead the use of steel conforming to standard specifications. Definite limits were also provided for the permissible proportion of impurities in the galvanizing spelter bath.



*Pouring molten steel
into the ladle prepara-
tory to teeming into the
moulds*

By A. J. Morgan*

The Metal Mine— WIRE ROPE PROBLEMS

WIRE rope consists of iron or steel wires, which are laid up into strands, and the strands thus formed are closed around a hemp or independent wire-rope center, thus forming the rope. Before continuing on the subject of wire rope and its application, it would be well to briefly describe the process of manufacture.

This description is necessarily of our processes since they are most familiar.

The steel is made in open-hearth furnaces and the charge consists of pig iron, iron ore, and scrap. In spite of the name "crucible cast steel," which is often given to one grade of wire rope, no steel for rope wire is made in a crucible. We have found that acid open-hearth steel is best for rope wire. It might be well to mention that the term "acid" refers to the lining of the furnace and the process, and not to the fact that there might be acid in the steel. After the steel has been thoroughly refined in the furnace and chemical tests have indicated that the analysis is proper, the steel is poured into a ladle from which it is teemed into ingot moulds, thus forming ingots.

After stripping the ingots are taken to the blooming mill, where they are thoroughly soaked to the proper temperature and then rolled through succes-

sive passes into "blooms." Certain percentage of both ends of the bloom are cropped to remove any pipes and segregations formed in the ingot. The bloom is then cut into billets, which are placed in the storage yard.

From the storage yard the billets are taken to the rod mill and rolled hot to the proper size of rod. It might be interesting to know that two minutes after the billets start through the rolls of the rod mill the finished rod is completely coiled. The rods at last pass, and while coiling attain a speed of approximately a mile a minute. The rods are then heat treated and thoroughly cleaned to remove all scale. They are then placed in a baking oven to remove all occluded hydrogen absorbed from the cleaning process. They are then ready to be drawn into wire.

After the rod has received its first pass through the die in the wire mill, it is then termed "wire" and loses its identity as a rod. In the blooming mill and the rod mill the ingots and the billets must be thoroughly soaked to the proper temperature since these are hot-rolling operations. The wire-drawing operation, however, is of a different nature, and the rods and wires are drawn cold. After the required number of drawings the wire is tested to see that it is developing the proper characteristics. It is then heat treated, cleaned and baked as before.

It is then returned to the wire mill for further drawing, and the wire, which is then at the proper diameter, is tested by the wire mill and shipped to the rope shop. Most of the finer sizes of wire must necessarily receive a further heat treatment, cleaning and baking before being drawn to finished diameter.

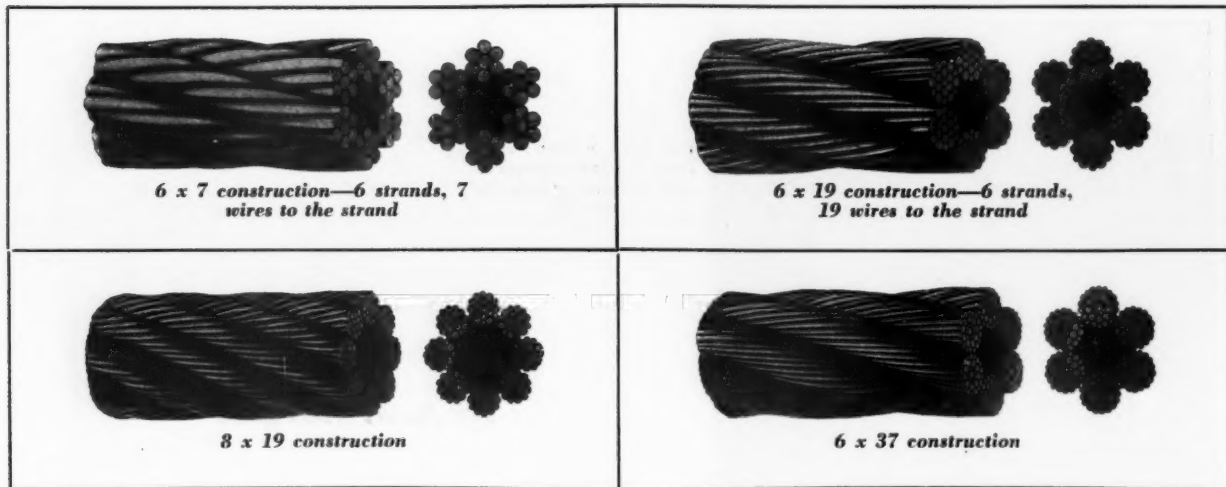
The rope shop on receiving the wire must again make check tests, since they are held responsible for all the wire entering into the rope. The accepted wire is wound on to spools which fit into the stranding machine. When the spools are filled, they are set into the machine, and the wires are threaded to the squeezer at which point they are laid together, thus forming a strand. The stranding machine winds the finished strand on bobbins, which fit into the rope-closing machine. The rope-closing machine lays the required number of strands around the center, thus forming the wire rope. These machines wind it on reels for shipment or reels for the stock room.

As with a great number of products, the science of the various operations is relatively simple, yet the art is difficult and must be highly developed in order that maximum results may be obtained.

WIRE ROPE SIZES

Wire rope is made in sizes from 1/16 in. in diameter to 4 1/4 in. in diameter, although the general commercial sizes do

* Chief Engineer, Wire Rope Division, John A. Roebling's Sons Company, Trenton, New Jersey.



not reach either limit. There are five qualities in commercial use, namely, iron, cast steel, extra strong cast steel, plow steel, and improved plow steel, the latter of which we term "blue center steel." There are four standard constructions of rope, namely, 6 x 7, 6 x 19, 6 x 37, 8 x 19, as illustrated. There are, however, many variations in strand construction, and the number of wires per strand may vary from 7 to 61, or even more wires should the condition call for it.

It will be appreciated that there is a wide variety from which to choose the proper rope. The selection of wire rope for the duty to be performed requires careful study and the grade and construction determined after such consideration. It is not true that the lower grade or the cheapest wire rope will prove most economical, since thorough analysis and service records have proven that the proper quality of rope and construction, even though the first cost be more, will prove most economical and safest in the final analysis.

It should be appreciated that the service received from wire rope on one installation can not be correctly compared with the service received from wire rope on another installation, even though they be exactly similar as far as the usual data are concerned. On each installation there is some condition which entirely governs the economy of rope life. It may be a different characteristic in the operation of the engine or a difference in some other part of the equipment or in the operating personnel. Therefore, it is necessary to consider installations as individual and make the necessary study and recommendation.

In order to have any check whatever, it is apparent that records must be kept, but it should be also appreciated that even the most carefully kept records will not entirely tell the story. For instance, the records will not show that the engineer got up on the wrong side of the

bed one morning and proceeded to take it out on the engine by opening the throttle and applying the brakes with undue severity.

TIME INTERVAL NOT GOVERNING SERVICE FACTOR

It is evident that the time interval of service is not the governing service factor and records on this basis are very misleading. Ropes handling greater average tonnage may show decreased total service over the average. A rope hoisting greater tonnage from lower levels will show reduced service over one hoisting its tonnage to higher levels. Ropes working less than average become affected by the corrosion factor, and where this condition exists more opportunity is accorded corrosion to penetrate the rope during the additional idle times. It is also true that a rope working only a few days a month is not apt to receive the same amount of attention as one which is working steadily. It is very odd, but in many instances it is not considered necessary to lubricate idle rope. This, however, is not true, and the rope during the idle period requires careful attention, so that moisture is not allowed to penetrate the rope and thus start corrosion.

It is really the number of trips made, with the distance traveled per trip and the loads handled, that should be considered, but, as mentioned before, this is very hard to obtain. The most satisfactory method for approximating this is to keep a record of the tonnage of ore or coal, or whatever the product is, and the level from which the tonnage is hoisted. This record should be kept with the tonnage from each level separate. It would seem as though wire rope used for hoisting, on which the life of miners and the production of the mines depends, would be worth more careful consideration, and the short time necessary to compile even more complete records

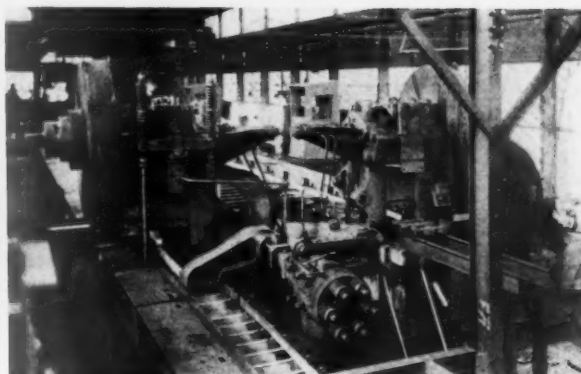
would be well spent. These records should show size, construction, quality, and make of the wire rope, the mine and the hoist where installed, the date when installed, whether rope is underwind or overwind, the date of cutting back on the drum and at the attachment to the cage or skip, the dates when lubricated and lubricant used, the date on which the wire rope was turned and the tonnage handled up to that time; the same data should be kept after turning, the date of removal from service and the total tonnage. The report should show the inspection reports on the rope showing the general condition and the worst broken up rope lay. Records should also show the changes in the main equipment, such as regrooving head sheaves, replacing the sheaves or the liners, or changes in speeds or loads. A careful analysis of this data after several ropes have been run would indicate whether or not changes could be made, either in rope or operating practice, which would produce more economical and safer service.

THE WORN WIRE ROPE

The worn rope indicates by its exterior appearance whether or not all of its useful life has been obtained. A comparison of the worn ropes will indicate relatively the amount of work done by the ropes. Ropes worn to the same extent can be assumed safely to have performed the same amount of work. It is then necessary to determine whether or not the efficiency of the operation and of the equipment has been the same in both cases. Upon these factors will depend whether or not the useful work performed by the rope is the same in one case as in the other. This statement is made because wire rope is very often called upon to perform a great amount of non-productive work. This may take the form of cutting out grooves in sheaves which are too small for proper operation with the rope, and also oper-



Open hearth furnace



From ingot to the billet mill as the ingot is rolled into a billet

ating on rollers which have worn to too small a diameter for satisfactory or economical operation. This may also include a greatly increased abuse to the rope, due to additional vibrations and hammerings which were not present before. It may also indicate that the lubrication of one rope has not been as satisfactory as that of a previous one which will allow more rapid wear and deterioration.

THE DRUM—AN IMPORTANT FACTOR

It would be advisable to mention a few points on the design, operation, and upkeep which materially affects wire rope costs. In order that economical wire rope service may be obtained, drums should be liberal in design; in fact, in some cases the drums should be even more liberal in design than is considered liberal in general practice. The rope should wind as few layers as possible, and where the greater number of layers are wound it is naturally essential that the drum diameter be increased in order to reduce the severe crushing pressures which occur on the drum. The drum should preferably be grooved and the pitch of the groove not too small for the new rope. Neither should the pitch be too great when additional layers of rope are wound. There are other factors which affect this, and they should be considered in the drum design. The fleet angle of the rope on the drum should be maintained within usual limits, which is generally taken at $1\frac{1}{2}$ degrees; this, however, varies with the ratio of rope diameter to drum diameter. The usual material of which drums are made is cast iron. However, there are many instances where drums made of steel castings are necessary, yet cast-iron drums are employed. This tends to increase not only wire rope costs but also drum replacement costs. On plain-faced drums it is necessary to use a steel starting piece which will start the rope to wind in a true helix. This improves the winding condition not only on the first layer but also materially on the subsequent layers. A condition

which is more difficult to fulfill on plain-faced drums is that the rope should wind an even number of wraps on the first layer. This condition, however, can be met when grooved drums are employed. With a grooved drum it is further possible to raise the last wrap of rope on the drum so that the second layer can be started without any undue abuse to the rope at this point. It is also desirable that the hole through the drum be arranged so that a radius is given the rope rather than a short, sharp break-over on the drum face. This hole should also be as close as possible to the flange so that the rope will be starting to wind adjacent to the flange. Filler plates on the flanges can often correct improper winding.

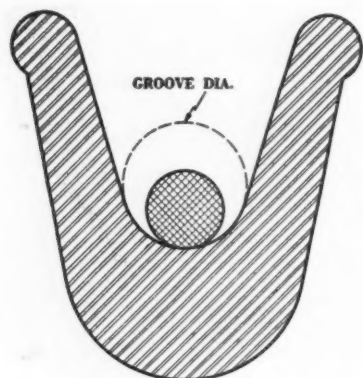
Frequently plain-faced drums become grooved, and these grooves are formed by rope which has reduced in diameter, therefore the pitch of the grooves is less than proper for a new rope. The new rope in being wound on a drum of this nature will be subjected to considerable extra abrasion and abuse and shorter rope life will result. It is not unusual to find that grooved drums have the grooves worn so that they in turn will pinch a new rope when installed. This is a difficult condition to correct, but, nevertheless, should be taken into con-

sideration when rope service is investigated. It frequently happens that drums, either grooved or plain-faced, corrugate with the lay of the rope. A condition such as this is extremely detrimental, and all possible steps should be taken to eliminate these corrugations before the new rope is installed. The corrugations in the drum are usually due to one of two things, either material of insufficient hardness or excessive unit radial pressure. Radial pressure depends upon the drum diameter and the operating tension of the rope. It is not generally appreciated that worn flanges on a drum materially influence the winding of the rope and consequently the abuse to the rope. In many cases this abuse becomes quite pronounced, thus resulting in short rope life. It is advisable that worn flanges be remedied and the rope be allowed to wind against flanges which remain straight.

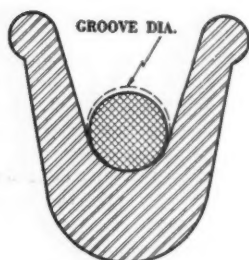
Considerable of the abuse to the rope on a drum is concentrated on relatively short lengths, as, for example, the section of the rope starting a new layer. It is not economical to discard the ropes on the condition of these short lengths, for which reason cutting off rope at the drum end will distribute this wear over a longer length and thus result in additional rope life. It is not advisable to



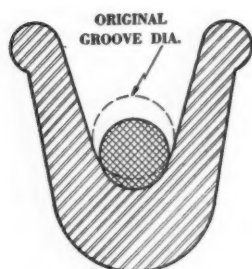
Billet storage sheds show stock of billets ready for transferring to the rod mill



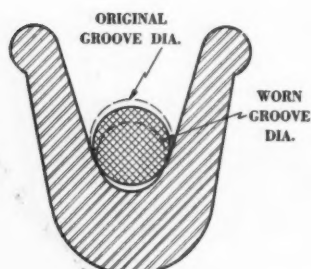
Incorrect design. Insufficient support for rope



Correct design. Groove diameter slightly full of rope diameter



Correctly designed sheave with groove worn to decrease diameter of the rope



New rope of nominal diameter in groove worn by previous rope of decreased diameter

cut an even number of wraps at the drum end but rather 1% or 2%, etc.

SHEAVES AND ROLLERS OF AMPLE DIAMETER

A short consideration of sheaves and rollers will again point out the necessity of having these of ample diameter. One of the most general causes for variable rope service is improper sheave and roller equipment. By improper it is not necessarily meant improper design or size, but that the grooves are not proper for the new rope when it is installed. For the usual size of rope used for hoisting, it is essential that the sheaves and rollers have a groove diameter which is at least $1/32$ in. full of new rope diameter. The table of Proper Clearances for Sheave Grooves, from the Roebbling publication *Wire Engineering*, January, gives helpful information:

Proper Clearances for Sheave Grooves

Normal rope diameter	Minimum clearances before sheave replacement or re-machining of grooves	Clearances for new or re-machined grooves
$1/4$ "	+ $1/64$ "	+ $1/32$ "
$5/16$ "	+ $1/64$ "	+ $1/32$ "
$3/8$ "	+ $1/32$ "	+ $1/16$ "
$7/16$ "	+ $1/32$ "	+ $1/16$ "
$1/2$ "	+ $1/32$ "	+ $1/16$ "
$9/16$ "	+ $1/32$ "	+ $1/16$ "
$5/8$ "	+ $1/32$ "	+ $1/16$ "
$3/4$ "	+ $1/32$ "	+ $1/16$ "
$7/8$ "	+ $1/32$ "	+ $1/16$ "
1"	+ $1/32$ "	+ $1/16$ "
$1 1/4$ "	+ $1/32$ "	+ $1/16$ "
$1 1/2$ "	+ $1/32$ "	+ $1/16$ "
$1 3/4$ "	+ $1/32$ "	+ $1/16$ "
1 7/8"	+ $1/32$ "	+ $1/16$ "
2"	+ $3/64$ "	+ $1/8$ "
$2 1/4$ "	+ $3/64$ "	+ $1/8$ "
$2 1/2$ "	+ $3/64$ "	+ $1/8$ "

Sheaves and rollers which are too small will greatly add to rope abuse, not only by additional bending but also by additional abrasion produced. Corrugated sheaves should be replaced whenever found. The reason for the corrugations should be determined, and, if improper material is being used, a material that is harder and will better withstand the pressures involved should be installed. It is frequently necessary to increase the size of the sheaves as well as to use a different material in order to produce desired results. Sheaves which have the grooves worn quite deep are a source of considerable extra abrasion to the rope, due to the fact that the rope wears against the sides of the deep groove and the different peripheral speeds produce a decided grindstone effect at this point.

Rope rollers are important, since the amount of abrasion on the rope can be governed by their proper spacing and use. The spacing should preferably be unequal, so as to break up any rhythmic vibration which might occur in the rope. Flat-faced rollers should also be of larger diameter than grooved ones. The material varies, sometimes cast iron is satisfactory and frequently steel castings and even manganese steel castings are necessary. Where rollers wear very fast

there is undoubtedly a knuckle condition and proper design of knuckle sheaves should be used at this point. Their installation while somewhat expensive will be amply justified by the decreased rope and roller abuse.

WIRE ROPE ATTACHMENTS

There are several ways in which the rope ends may be secured. The desirable one, and the one which develops 100 percent of the rope strength, is a socket connection. A properly designed wire rope socket correctly attached will always break the rope at its full strength. A proper socket connection consists of the wire ends being separated and straightened, thoroughly cleaned with gasoline or kerosene and then with muriatic acid and placed in the socket; pure zinc spelter should be used for filling. A thimble spliced in one end of the rope is often used for an attachment, and its efficiency varies from 75 to 90 percent, depending upon the rope size. The thimble connection is also used with wire rope clips, this attachment being about the same efficiency as the splice. It is essential, however, in order that maximum efficiency be obtained that the clips be applied cold about one rope lay apart, tightened securely and the U-bolts of the clips always placed on the dead end of the rope. Some improper clip attachments result in strengths as low as 60 percent and sometimes less. The thimble is also used with three-bolt clamps and this efficiency, when the clamps are properly designed, runs about the same or in excess of that of the clips. Clips and clamps should be tightened after about an hour's run and at regular inspection intervals after that. It is essential in all of these connections employing the thimble that a proper design of wire rope thimble be used. It should be one which has a sufficient size of an eye and also one which furnishes the proper amount of support to the rope.

FATIGUE IN MINE ROPES

The section of the rope directly adjacent to the wire rope attachment is subject to much fatigue in mine hoisting. It is essential that a length of rope be cut off at the attachment end and the attachment made at frequent intervals, these intervals varying from one month to six months, and, in some cases, where fatigue is unusually rapid, a three weeks' interval is established. This is due to the stopping of all vibrations at this point, and the resulting fatigue to the wire is concentrated in a short length of rope. Cutting the rope at the attachment end also changes the rope position on the head sheave and next to the drum while loading and accelerating. This change is quite desirable, since it has been found that the wire rope in contact with the head sheave, or next to

the drum, under these conditions is fatigued materially, depending upon the size of equipment used. The drum and sheave diameters, as recommended in wire rope catalogs, is desirable for average service conditions. These, however, vary considerably when standard equipments are considered. Practice has begun to accept for the 6 x 19 class of rope of 60 diameters as a minimum where sizes of drums are concerned and also 72 diameters as a minimum for head sheave design. For example, it has been found that even with 72 diameters for the head sheave serious fatigue often occurs in the rope in contact with the sheave. With increase to 80 diameters for the head sheave, tests indicate that the fatiguing action is materially reduced but is still present. When 90 times rope diameter for head sheave is employed the fatiguing action practically disappears.

LUBRICATION OF WIRE ROPE

Proper lubrication of a wire rope is essential to good and safe service. It is not possible for the manufacturers to place sufficient lubrication within a rope to last throughout its entire life. When it is appreciated that there are 114 wires in a 6 x 19 hoisting rope, and that they are all in contact at three or more points, it will be seen that there are a great number of rubbing surfaces. It should be further appreciated that once corrosion starts inside a wire rope it can seldom be stopped. The part of the rope in contact with other wearing surfaces polishes sufficiently so that the noticeable marks of corrosion are erased. Therefore it is necessary to look further for evidences of this. One way would be to take the lubricant out of the valleys of the rope and examine the wires carefully in between the strands. A better way is to cut an end of the rope, take it apart, and examine all of the inside wires and also the center. The center of the rope should be maintained in a lubricated condition, and this can be done when proper lubrication is employed. It is very difficult to state definitely any law which will apply to lubrication in general. Each operation has a different condition, which allows one lubricant to work satisfactorily whereas in another mine that same method of lubrication would not protect sufficiently. Therefore the proper method of lubrication and the proper interval can be obtained readily by close examination of the rope and a study of the various grades of lubricant. For an extremely wet condition the protector is essential, and this varying to the plain lubricant where corrosion is not a factor. Various degrees of protection and lubrication can be obtained by mixing the protector and lubricant together. It is essential to use a lubricant which has been made for

lubricating wire rope, since in some cases the lubricant used has been more detrimental than the elements against which it was used to protect. For some conditions the lubricant can be satisfactorily applied as a grease, in others a light oil which can be applied cold. However, for mine work it is essential that the lubricant be applied hot, since this method of application allows penetration within the rope. The lubricant should not be just painted on, but the rope should be allowed to run through a trough or a box with sufficient depth of lubricant to allow the rope to be in it for some little time. The rope should also run slowly, which will allow time for penetration. A wiper at the end of the box will prevent the escape of excess lubricant. It seems hardly necessary to say that the best way to keep the rope lubricated is to get it there at the start of service and keep it there during service. If the rope is neglected for any length of time, it will be extremely hard to obtain the proper degree of lubrication throughout. Proper lubrication will increase wire rope service. It is often stated that the increased service does not justify the additional expense. It can, however, be stated that in general the additional expense is justified by increased wire rope service; however, the expense of lubrication is amply justified if for no other reason than that the safety of the operation is assured.

REMOVING WIRE ROPES FROM SERVICE

A question which is particularly important, and one which should receive considerable attention, is when should a rope be removed from service? It is true that, important as this question is, a definite answer to cover general conditions is difficult to make. A few considerations, however, can be pointed out which will allow a better understanding of this subject. It is first necessary to determine the factor of safety to which a rope may safely deteriorate. The estimate of the remaining strength of a wire rope can be safely checked, if the amount of metal removed is known, since the remaining strength of the wire rope can be stated to be approximately the same as the remaining metallic area, provided there is no corrosion. The metallic area removed consists of that removed by abrasion and also by broken wires. The proper way to count a wire rope for remaining strength is to obtain the number of broken wires in the worst rope lay. By rope lay is meant that length of rope in which a strand makes one complete revolution about the rope axis. In this connection, it might be well to state that the reserve strength of a wire rope consists of those wires which never come in contact with any exterior wear. They are termed the center and inside wires of the strand. It is essential that this re-



Preparing the end of the rope before attaching a socket



Remove all seizings except one nearest socket. After cooling, socket is ready for service

serve strength remain intact throughout the service of the rope. With this condition, and also the condition that corrosion is not a factor, a surface inspection of a wire rope should indicate very closely its remaining strength. It is necessary to repeat that corrosion must not be a factor, otherwise no safe indication is available for estimating the remaining strength in the wire rope. The reserve strength of a 6 x 7 rope is approximately 16 percent of the ultimate strength of the rope. The reserve strength of the 6 x 19 class of rope varies from about 32 percent to 43 percent. The reserve strength of the 6 x 37 class of rope is from about 48 percent to 58 percent. It will be readily appreciated from these figures that when more wires per strand are used in a wire rope a greater number of broken wires can be safely allowed than when a strand of fewer wires is employed. This is a factor to take into consideration during inspection. It can be stated that when the wires in a rope are worn half way through that the possibility of their breaking is great. A very good indication of the con- (Continued on page 163)

Safety Report and Recommendations

SAFETY COMMITTEE, COLORADO MINING ASSOCIATION

By
E. H. Denny*

IN July of last year at a meeting of the Industrial Commission of the State of Colorado, the Colorado State Bureau of Mines, and various mine operators the apparent necessity of an increase in compensation insurance rates unless accident costs could be reduced was discussed. One very evident way to reduce accident costs is to reduce the number and severity of accidents. The question of possible assistance by the United States Bureau of Mines was raised and the writer advised the meeting that the District office of the Safety Division of this bureau would be glad to render any assistance possible through visits to mines and conferences and discussions with groups of interested mine officials or miners. Similar assurance was received in writing by the Industrial Commission from Director Turner, of the U. S. Bureau of Mines.

The writer pointed out at this meeting that the acceptance of any suggestions made by Bureau of Mines engineers was purely voluntary on the part of the operator, and the safety work of the bureau was entirely cooperative with the mine operators, miners, and State commissions and inspection departments, and that the bureau had no supervisory powers, and desired none.

Subsequent to this July meeting the Colorado Metal Mining Association through its president and secretary appointed an operators' committee consisting of Messrs. J. C. Bailey, W. J. Coulter, R. L. Jones, J. J. Shaw and George E. Collins to study safety and compensation problems and to work with the operators of the State, the commission, and the State and Federal Bureau of Mines to reduce accidents. On October 11 the Colorado Metal Mining Association advised the writer formally that this organization desired him to visit interested mining companies, to examine into mining conditions and practices, and

study means to lessen Colorado mine accidents.

The writer since that date has visited several Colorado metal mines and has observed some very meritorious safety practices and others that may be termed sub-standard and dangerous. Also one general district safety meeting has been held. The fact that 3 mine explosions, 1 mine fire, and 1 gas inundation occurred in November and December in this and a neighboring state has made it impossible for the District office of the United States Bureau of Mines to make anything like a complete study of mine conditions, but the following suggestions and observations are submitted as the result of the limited study made; it is believed that they may in part apply to other metal mines in Colorado.

As a result of these visits to Colorado mines the writer makes the following suggestions for mines in which measures advocated are not already in force:

1. That at mines employing more than 25 men a mine safety committee be formed of the superintendent, foreman, of other representative mine officials, both from the surface and underground, and of representatives selected from the miners. That the members of such committees ask themselves in their work from day to day "are conditions and practices such that an accident can happen here?" That regular meetings of this committee be held monthly or oftener and the members bring up for discussion safety problems from their daily observations; also that all lost time accidents occurring be studied with a view to preventing their recurrence.

2. That in mines with fewer men the official or officials in charge constitute themselves a safety committee with similar work.

3. That all miners and officials be made familiar with safety rules and recommendations as published by the State Bureau of Mines and that these rules be

added to suit safety practices in the particular mine concerned.

4. That companies notify their employees through special letter that they require their men to work safely and follow the company safety rules.

5. That after company officials and men are familiar with the safety provisions of the state law and the company safety rules that warning and disciplinary measures be used to enforce safe practices.

6. That companies keep a record of all accidents by causes so as to be able to fix the principal causes of accidents and thus be able to work toward their lessening.

7. That miners be required to wear goggles in breaking rock, picking, in starting to drill, in blowing out holes, and perhaps in pulling chutes.

8. That safety belts be used at pockets and similar locations when there is danger of men falling into such pockets, raises, and chutes.

9. That an investigation and report for company information and files be made on all lost time accidents, such report to fix the cause and responsibility for the accident and measures needed to prevent its repetition.

10. That accident prevention bulletins be placed at appropriate places for men to read. Perhaps your association can help in securing such posters.

11. That protective or "hard boiled" hats be required worn in all underground work, but that there be no abatement in effort to avoid loose rock or falling objects and material because of the use of the hats.

12. That the use of safety shoes be considered.

13. That consideration be given to surface and underground fire hazards, that such measures as are economically possible be used to lessen such hazard and fire fighting equipment be installed for effective fire fighting.

* District engineer, U. S. Bureau of Mines.

14. It is difficult for miners and mine officials to work whole-heartedly toward safety as long as very apparent hazardous and dangerous conditions exist. Lastly, therefore, it is suggested that mine officials continually work toward the elimination of sub-standard and dangerous conditions and practices. The following are offered as examples of sub-standard conditions and practices observed in some Colorado mines, no one mine, of course, having all of these conditions and practices.

1. Miners were observed to delay or entirely neglect to take down loose rock in the back or hanging wall. Rock falls causes about 27 percent of all fatalities in metal mines; the remedy is carefulness and discipline, the fault rests with management as well as the miner.

2. Miners were observed to delay or neglect cleaning down manways, and raises after blasting. Loose rock and debris over a man on a ladder is a double menace. This is again a matter of carefulness and discipline.

3. Ladderways traveled frequently by men were observed and traveled, extending 40, 60, and more feet vertically or even in places overhanging back from the vertical, these ladderways having either no intermediate platforms or landings or such intermediate landings having little value in interrupting a person's fall. Doors are frequently not installed in sollar. Ladders were traveled having from one to four consecutive rungs missing; some ladders were insufficiently or insecurely fastened in places where ladder slippage would mean a probable fatal fall.

4. Winzes were observed without timbered collars.

5. Manways opening into the level above were observed without protecting doors or coverings.

6. Large open abandoned stopes above traveled levels were observed with no protection afforded against possible loose rock.

7. Abandoned stopes opening along traveled drifts were observed not railed off.

8. Open ore passes were observed not railed off or protected by grizzlies.

9. Collaring of holes and breaking of rock were observed done without goggles or other eye protection.

10. A man was observed breaking rock standing in a car under a chute with gate up in total disregard of probability of issuance of a shower of rock from chute.

11. Men were observed prying loose rock out of chutes with bar while standing directly in front of chute and in place with clearance too limited

between car and wall to quickly move body or feet.

12. In some chutes with two wood gates and drill steel bar, the steel bar was extended across the chute and extending out in the drift so as to be in the direct line of a traveler's face or eye.

13. Explosive boxes were observed opened with pick.

14. A sack of fuse and caps were observed tossed off cage to be caught by man on the level.

15. Instances of storage of boxes of explosive and capped fuse within a few inches of rail were observed. Capped fuses were observed stored within 2 feet of boxes of explosive.

16. Overhead 440-volt power lines were observed placed less than 5 feet 9 inches above rail.

17. Use of insufficient platforms or no platforms on upper floors of square set stopes and in raises were observed.

18. Wiring was observed passing through wood door frames and wood partitions without proper insulators.

19. Old, useless timber and empty powder boxes were observed piled at random in crosscuts and wide spots without regard to fire hazard. A small timber fire may make sufficient smoke and carbon monoxide gas to imperil every man in the mine.

20. Abandoned surface shaft houses and other mining buildings were observed which if they took fire because of mine interconnections and lack of fire doors would likely imperil the lives of men in working mines. Emergency fire doors in operating mines would oftentimes minimize this hazard.

21. Almost total lack of underground fire protection was noted in some cases.

22. Locomotives were observed operating in some places where there was almost no man clearance and no refuge holes.

23. Lack of accident records classified as to causes was found in several instances.

24. Dry drilling was observed in several instances.

25. No safety meetings or safety organization were reported in several instances.

26. Much work is so scattered in old mines that men work with infrequent and consequently little supervision. Sometimes these men have little mining experience.

27. Protective or hard boiled hats are little used in some mines. Protective shoes are unknown in some mines. Goggles are little used in some cases even if provided.

28. Carbide is sometimes stored in too large quantities underground and without regard to surroundings.

The above is not a complete list of sub-standard practices and conditions observed. The writer wishes to call attention, however, to the fact that many of them can be corrected at little or no expense by the operator and miner.

Of course, the mere remedying of sub-standard or dangerous conditions and practices will not eliminate accidents; conditions and practices can be made as safe as economically possible and thus cut out many accidents. But even after this is done there remains even more important elements of accident prevention, among which are education of miners and officials to safe practices, organization of miners and officials into a body working steadily and constantly toward carefulness, and discipline of careless men and of careless officials to demonstrate that the company desires safety and will not tolerate carelessness.

If time permitted I might enumerate an even longer list of excellent practices and excellent mine conditions and perhaps such a list would be of value after further study.

Again, one method of reducing accident cost is to reduce accidents. But this reduction of accidents can not be accomplished without hard, continued effort directed and inspired by the mine management.

We, of the U. S. Bureau of Mines, will be glad to visit any interested operators and study and discuss with them their safety problems and to gain from their knowledge and experience some safety ideas which may be of value to other operators. If a written confidential report is desired by any operator we will be glad to make one to him; however, if he wishes only an oral study and discussion we will be glad to suit his wishes; we do, however, wish to be able to summarize conditions as in this report without reference to any particular mine for the possible benefit of Colorado operators generally.



Montezuma National Forest, Colorado

INDUSTRIAL DEVELOPMENT CONFERENCE



*Captain R. M. Watt
Chairman, Board of
Governors, Southern
Division, the American
Mining Congress*

*Program for the Sixth Annual
Conference of Southern Division
of The American Mining Congress
at Louisville, March 16-18*

THE forthcoming sessions of the Sixth Annual Industrial Development Conference to be held by the Southern Division of the American Mining Congress at the Brown Hotel, Louisville, from March 16 to 18, promise to draw an interested group of officials of the Southern states and their industrial leaders. Interest in the conference is heightened by the fact that a conference of Southern Governors will also be held and reports will be made on the beneficial results which have accrued to Kentucky and her industries through intensive development programs carried on by the Kentucky Progress Commission in cooperation with the American Mining Congress, and the initiation of similar surveys in Arkansas by its officials and commercial organizations.

Government officials and members of Congress are expected to deliver addresses to the conference, which will be opened the morning of March 16 by Capt. R. M. Watt, of Pineville, representing the Kentucky Utilities Corporation and the Kentucky Progress Commission, who as chairman of the Board of Governors of the Southern Division of the American Mining Congress, will review the activities of the organization in promoting the development of Southern industries during the year. Addresses at this session will be made by E. F. Gerish, chief of the Domestic Regional Division of the Department of Commerce; Hon. J. C. Stone, of the Federal Farm Board and of the Kentucky Progress Commission; and by Col. Joseph B. Reynolds, director of public

relations of the Mid-West Utilities Company of Chicago.

Clarence E. Abbott, vice president of the Tennessee Coal, Iron and Railroad Company of Birmingham, and member of the Board of Governors of the Southern Division for Alabama, will preside over the afternoon session on March 16 and the evening session will be presided over by J. L. Wilkes, president and general manager of the Jacksonville Railway Terminal Company, who represents Florida on the Board of Governors.

The conference of the Governors of the Southern States will feature the morning session on March 17, with Col. J. W. Harrelson, director of the Department of Conservation and Natural Resources of North Carolina, and representative of that state on the board of the Southern division, presiding. The principal speaker at this conference will be Gov. Flem D. Sampson, of Kentucky, who will describe the activities and results of the industrial development work carried on by the Kentucky Progress Commission. Other governors attending the conference will also address the delegates on pertinent questions affecting Southern development of industries and natural resources. In addition to the governors of the Southern states, the governors of the border states, Ohio, West Virginia, Illinois and Indiana, have been invited to attend this conference.

GOVERNORS' CONFERENCE

The governors' conference will continue at the afternoon session, and be presided over by E. W. Vennard, gen-

eral manager of the Southwestern Gas and Electric Company of Shreveport, La., representing Louisiana on the board of the Southern Division. It is expected that the speakers at this meeting will include Representative Henry B. Steagall, of Alabama; Senator J. Hamilton Lewis, of Illinois; Representative Charles Adkins, of Indiana, and others of prominence.

At this session reports will be made on the progress of industrial development projects in the various Southern states. Dudley V. Haddock, of Little Rock, secretary of the Arkansas State Chamber of Commerce, will tell the conference of the plans for promoting industrial development in that state which are now under way in cooperation with the American Mining Congress, similar to those recently conducted by it in Kentucky. Other state reports will be made by the following: W. W. Smoak, of the Natural Resources Commission of Waltherboro, S. C., for South Carolina; Thad Holt, of the Alabama Industrial Commission, of Birmingham, for Alabama; Dr. W. R. Jillson, state geologist, Frankfort, Ky., and Mrs. Ellen S. Woodward, the Mississippi State Board of Development, of Jackson.

On the evening of March 17 the annual banquet of the conference will be held, with Dean F. Paul Anderson, of the University of Kentucky, acting as toastmaster. S. Livingston Mather, of the Cleveland-Cliffs Iron Company, of Cleveland, president of the American Mining Congress; John E. Edgerton, president of the National Association of Manufacturers, and Judge Bingham, editor of the Louisville *Courier Journal*, are expected to deliver addresses.

Others who have been invited to address the conference at its various sessions include: Frank Gould, editor of

the *Manufacturers Record*;" W. R. Cole, president of the Louisville and Nashville Railroad; Walter L. Crocker, president of the John Hancock Life Insurance Company, of Boston, and Col. Wade Hampton Cooper, banker of Washington, D. C.

The last day of the conference, March 18, will be devoted to a sight-seeing tour of industrial plants at Louisville and vicinity, and to Mammoth Cave, Fort Harrod and Boonesborough, points of historic interest in Kentucky.

STATE DELEGATES

Governors of the Southern states are appointing delegates to attend the conference sessions. To date the following have been named:

By Governor Henry H. Horton, of Tennessee: Wm. H. Lindsey, Crescent Coal Co., Nashville; Paul J. Kruesi, Southern Ferro Alloys Co., Chattanooga; J. Fred Johnson, Kingsport Improvement Assn., Kingsport; J. E. Edgerton, president, U. S. Manufacturers Assn., Lebanon; Chas. C. Gilbert, secretary, Tennessee Manufacturers Assn., Nashville; J. M. Houser, Tennessee Copper Co., Copperhill; J. J. Gager, Gager Lime Co., Chattanooga; Jas. A. Barr, International Agricultural Corp., Mt. Pleasant; Walter F. Pond, state geologist, Nashville; Vic Hacker, president, Southern Appalachian Coal Operators Assn., Knoxville; E. C. Mahan, director, National Coal Assn., Knoxville; C. W. Henderson, Cambria Coal Co., Knoxville; Charles Moore, president, Moore Coal Co., Knoxville; Dr. W. D. Young, Tennessee Products Corp., Bon Air; C. Hoyt Bradford, Fentress Coal & Coke Co., Nashville; John Toomey, real estate, Helenwood; Hon. Frank D. Fuller, secretary, Tri-State Fair, Memphis; Henry E. Colton, Rocky River Lumber Co., Nashville; R. R. Caskey, Signal Mountain Portland Cement Co., Chattanooga; J. O. Siegler, Tennessee Coal Iron & R. R. Co., Whitwell; James L. Akers, Annette Mining Corp., Coker Creek; J. W. Russwurm, general manager, State Fair, Nashville; Wiley Evans, chief mine inspector, Nashville.

By Governor John G. Pollard, of Virginia: Dr. A. C. Bevan, University; Hon. Lee Long, Dante; Hon. LeRoy Hodges, State Chamber of Commerce, Richmond; Prof. R. G. Holden, V. P. I., Blackburg; E. A. Hults, manager, Mathieson Alkali Works, Saltville; W. H. Sage, manager, Alberene Stone Co., Alberene; Dr. Wilbur A. Nelson, University; W. D. Tyler, Dante; Hon. E. Lee Trinkle, Roanoke; P. Ryland Camp, Franklin; Milton E. Marcuse, Richmond; J. C. Phillips, Tappahannock; Thomas J. Wright, Norfolk; Ellis Olsson, West Point; Thomas W. Ozlin, Kenbridge; A. N. Carroll, Rocky Mount; Capt. D. H. Barger, Shawsville; Dr. H. S. Hedges,

Charlottesville; Max Fleischer, Gordonsville; A. G. Russell, Jr., Tazewell; T. M. Gathright, Covington; Dr. Julian Burrell, president, V. P. I., Blacksburg; Chapin Jones, University; T. Gilbert Wood, Roanoke; Wilbur O'Byrne, Blacksburg.

WIRE ROPE PROBLEMS (From page 159)

which broken wires develop. To properly observe this it is necessary that the results of the inspection be entered on some form such as the report sheet mentioned before. The record of broken wires at the worst rope lay should be kept by showing the number of wires broken in each strand, since the concentration of breaks in a few strands results in greater loss of strength than where they are uniformly distributed. When the broken wires do not develop rapidly, but occur only occasionally, the wire rope is not in a fatigued condition. When the broken wires develop rapidly, however, the indications are that the wire rope is becoming considerably fatigued and should be carefully watched, with the period between inspections decreased, so that more careful check can be made. The inspection should consist not only of observing the section of rope in contact with wear, but also the rope around the attachments. It is essential that this be carefully examined to determine whether or not any broken wires have developed under the clips, if they are used, or in contact with the wire rope thimble, if this is of insufficient design. An examination should also be made at the entrance to the socket. A proper time interval for cutting and reattaching, however, will relieve any possibility of wires breaking at this point. One of the best ways to tie this inspection report with the actual condition of the rope is to cut the worst section of the rope after it has been removed and have it tested. The strengths developed will indicate whether or not the ropes are being used the proper length of time. It is quite possible that additional service can be safely obtained.

It is found that very often the operators feel that the recommendations made by wire rope manufacturers are made primarily as a means of having them spend more money. It would be very desirable if the impression could be left that these recommendations are made with the knowledge that the possibilities are such that the changes will amply repay the user in not only economy of wire rope but also in equipment. Unfortunately the real saving from these changes does not become immediately apparent. It frequently takes two and three and sometimes four years to show

that the saving has been accomplished. It is felt that in some cases this retards necessary improvement and results in a prolonging of adverse conditions which are resulting in short and variable rope life. It is hoped that the subjects touched on in this article have brought out some of the general conditions governing rope life and result in the wire manufacturers being consulted more before the final designs are accepted and the equipment furnished. It is before the equipment is furnished that changes can be most easily made.

Production of Electricity and Consumption of Fuels by Public-Utility Power Plants in 1930

Preliminary figures of the total production of electricity by public-utility power plants in the United States in 1930 indicate an output of 95,638,000,000 kilowatt-hours, a decrease of nearly 2 percent from the output in 1929.

This is the first year since 1921 that the total annual production of electricity was less than in the preceding year, but in making comparisons it should be kept in mind that 1929 was a year of maximum production in most industries.

The production of electricity by the use of water power in 1930 was about 5 percent less than that in 1929, which, in turn, was about 0.3 percent less than that in 1928. These decreases were due mostly to the deficiency in precipitation during 1929 and 1930, which decreased the flow of streams utilized for water power. In 1930 the precipitation in 40 states was less than normal and in 18 states all previous records of low precipitation were broken.

The production of electricity by the use of fuels in 1930 was a little more than in 1929. The consumption of fuel, however, was nearly 4 percent less. In 1929, 62.3 billion kilowatt-hours of electricity was generated by the consumption of 52.6 million tons of coal. In 1930 the figures were 62.4 billion kilowatt-hours and 50.6 million tons, or 2 million tons less coal than in 1929. The average quantity of coal consumed in generating 1 kilowatt-hour of electricity in 1930 was about 1.62 pounds. This is about half the average for 1929. The decrease year after year in the average consumption of fuel by public utility power plants in the generation of electricity is a remarkable achievement, especially in recent years, when the average has been approaching the possible minimum.

The information is based on the figures of production of electricity previously published in the monthly power reports issued by the Geological Survey. The output of central stations and electric railway plants represents about 98 percent of the total of plants of all types.

Interest Focusing on Cincinnati Meeting



A MEETING which promises to surpass in significance and importance the seven previous annual gatherings looms on the horizon. One of the finest and liveliest of programs is being given its finishing touches for the Eighth Annual Meeting of Practical Operating Men and the National Exposition of Coal Mine Equipment to be held in Cincinnati the week of May 11, under the auspices of The American Mining Congress.

New themes and new developments of old themes of genuine importance to safe, efficient and profitable coal production are embodied in the topics for the 10 sessions. The morning session, Monday, May 11, will be devoted to "Modern Coal Mine Management," with two papers scheduled—"The Trend Toward Better Management," by P. C. Thomas, vice president of the Koppers Coal Company, and "Budgeting Repair Work," by B. H. McCracken, mechanical engineer of the Consolidation Coal Company. George W. Reed, vice president in charge of sales of the Peabody Coal Company, has been invited to preside as chairman.

Two sessions are to be devoted to "Safe Operating Practice." The first of these on Monday afternoon, May 11, will be featured by a paper on "Maintaining Discipline," by Thomas G. Fear, of the Consolidation Coal Company, and another by Charles W. Conner, superintendent of mines, outlining the safety program of the mines of the American Rolling Mill Company, covering records which have been made, methods of enforcement of safety rules, etc. The second safety session will be held on Wednesday afternoon, May 13. R. M. Lambie, chief of the Department of Mines of West Virginia, will speak on "The Cost of Mine Accidents"; W. J. Jenkins, president of the Consolidated Coal Company of St. Louis, "Safety and Mechanical Mining"; "Safety at the Face," by F. B. Dunbar,

general superintendent of Mather Collieries; "Safety with Conveyors," by Albert L. Hunt, general superintendent of the Pennsylvania Coal & Coke Company; "Safety with Electrical Equipment," by W. P. Vance, general superintendent of Butler Consolidated Coal Company. A large percentage of the operators who have attended the sectional meetings of the Program Committee have expressed their desire for a quite complete discussion on the subject of enforcing mine safety rules, and an interesting session is assured. P. M. Snyder, president of the C. C. B. Smokeless Coal Company, will preside.

With the idea of bringing up to date the latest developments in the different methods of mining throughout the coal industry, the Tuesday morning session, May 12, is divided in such a manner as to cover this subject by districts, as follows: Pennsylvania, Illinois-Indiana, Southern District, Far West, Oklahoma, and strip mining in general. The papers to be presented, as an illustration, will deal with modifications of present mining systems, with particular reference to Mechanical Mining. George F. Campbell, vice president of the Old Ben Coal Corporation, is chairman for the session.

Although the subject of Mechanical Mining will be prevalent throughout most of the meetings, there will be two gatherings devoted entirely to this phase of coal production. The first, with Thomas T. Brewster, president and general manager of the Mt. Olive & Staunton Coal Company, presiding, is slated for Tuesday afternoon, May 12, and will cover mechanical mining in thick seams.



Mr. Taggart, who is Vice President of the Stonega Coke and Coal Co., is chairman of the Program Committee of the Cincinnati Convention

The papers include "Loading Machines," by E. J. Christy, consulting engineer of the Wheeling Township Coal Mining Company; "Gathering System with Mechanical Mining," by C. J. Sandoe, vice president of the West Virginia Coal Company of Missouri; "Mechanized Mining at Carbon Fuel Company," by C. A. Cabell, president of the company, and "Mechanical Loaders in Thick Seams," by a representative of the Far West Branch of the industry. H. L. Warner, of W. H. Warner & Company, will preside at the second mechanical mining session, which will be devoted to thin seam operations. T. F. McCarthy, assistant general superintendent of the Clearfield Bituminous Coal Corporation, will present a paper on "Conveyor and Scraper Mining in Thin Seams," and J. D. Rogers, general manager of Stonega Coke & Coal Company, will present "Long Face Conveyor Mining." Other papers will cover thin seam mining in the Birmingham district and in Arkansas.

"Anthracite" will have the spotlight at the session Wednesday morning, May 13, and it is only necessary for one to glance through the list of papers on the program to realize that there will be "standing room only." The papers follow: "Anthracite Research for Utilization," by C. A. Connell, general manager of the Anthracite Coal Service; "Results

of Present Anthracite Roll Practice," by Paul Sterling, mechanical engineer, Lehigh Valley Coal Company; "Preparation of Anthracite Fines" (author not definite); "Speeding Up Rock Work in Anthracite Mines," by Russell L. Suender, of Hill & Suender; "Notes on Mechanical Mining in Anthracite," by John C. Haddock, president of the Haddock Mining Company. The chairman of this session will be E. H. Suender, vice president and general manager of Madeira, Hill & Company.

A variety of timely subjects are on the program for Thursday afternoon, May 14, when a session devoted to "Recent Developments in Mining Practice" will be held. Newell G. Alford, of Eavenson, Alford & Hicks, will present a paper on "Main Line and Gathering Haulage," and, in view of the many improvements which have been made in this phase of mining, a discussion covering track, scheduling, block control and trip dispatching will draw considerable interest. "Cutting, Drilling and Blasting" will be presented by G. C. McFadden, assistant vice president of the Peabody Coal Company. An interesting account and results of research along the lines of "Treating Machine Bits" will be told by H. H. Taylor, Jr., of the Franklin County Coal Company. David Ingle, president of the Ingle Coal Company, will deliver a paper on "Conveyor Slope Installation and Operation." The chairman of this session is C. F. Richardson, president of the West Kentucky Coal Company.

The meeting on Friday morning, May 15, devoted to "Recent Developments in Coal Cleaning," will in itself be a short course in coal preparation, meriting the attendance of all operators who are in any way interested in achieving the best results in this phase of production. Erskine Ramsay, chairman of the board of the Alabama By-Products Corporation, will preside, and the following papers are listed: "Aersand Plant of Allegheny River Mining Company," by R. M. Shepherd, president of the company; "Recent Developments in Coal Cleaning in Southern West Virginia" (author not definite); "Developments in Coal Cleaning," by D. J. Carroll, of Chicago; and "Successful Handling of Refuse," by F. S. Follansbee, chief engineer of the Koppers Coal Company.

There has been a wide demand this year for a broadening of the program to include a general discussion of the practical side of fuel utilization, and this will be the theme of the final session on Friday, May 15. Dr. John R. Turner, president of the University of West Virginia, will present at this meeting a paper on "Research on Coal for Utilization."

Lively and interesting discussions fol-

lowing the presentations of the various papers have always been the order, and the 1931 Cincinnati meeting will be no exception to this. Printed copies of practically all the papers will be distributed before the sessions, and the authors will give their subjects in brief form so as to allow as much time as possible for the "free-for-all" to follow.

An exposition which bids fair to top

anything of its kind ever attempted will fill both wings of Cincinnati's gigantic Music Hall to overflowing. Machinery and equipment of all kinds, animated models of plants and installations, miniature motion pictures and even "talkies"—these and much more will go toward making the Eighth Annual Exposition of Coal Mine Equipment an education in itself.

COMMITTEE ON FOREIGN RELATIONS REPORTS ON COMMERCE WITH SILVER-USING COUNTRIES

THE Committee on Foreign Relations, of the Senate, has been giving detailed consideration to Senate Resolution No. 442, advising the President as to the depressed condition of our commerce with China, and other silver-using countries. This resolution has now been passed by the Senate.

A special subcommittee of the Foreign Relations Committee, composed of Senators Pittman (Nevada), Johnson (California), Swanson (Virginia), Vandenberg (Michigan), and Shipsted (Minnesota), has presented to the chairman of the committee, Senator Borah, its views as to how the situation may be remedied, and in support of its recommendations includes in its report the views of leaders in national and international affairs. We quote these views, as follows:

President Hoover, speaking before the American Bankers' Association, at Cleveland, October 2, 1931:

The buying power of India and China, dependent upon the price of silver, has been affected.

Julius H. Barnes, chairman of President Hoover's National Business Survey Committee, in an article written by Mr. Barnes in the *New York Times* of November 2, 1930:

The final mistake was made of treating silver as a commodity although it still represented resources and capital and credit to more than half of the population of the world. Silver, which had been a standard money of the world for 20 centuries, was in a few months to be treated in the market as a commodity, without mature consideration as to the effect on the initiative and confidence of a thousand million people. A price of silver which fluctuated from \$1.35 some few years ago to 35 cents today, and yet symbolizes the credit and resources of a great people, could not but harm the business structure of the world.

Thomas W. Lamont, as reported in a recent press article:

One of the chief causes of world depression is the scarcity of gold and the depressed price of silver.

George E. Anderson, noted writer on economic and financial problems, in the *Annalist*:

The effect of the general slump in the price of the metal (silver) has been more far-reaching than had been anticipated. The drop in the price of the metal, of course, directly affects silver producers in the United States, Mexico, Canada, and various South

American countries; but its chief effect upon the world of trade is in those countries using silver as a monetary medium—China, Abyssinia, and a few minor nations, but chiefly China. * * * The uncertainty of the financial situation naturally has stopped further purchases abroad. In short, the silver situation goes to the very heart of commercial and industrial China with paralyzing effect.

Senator William E. Borah, chairman, Foreign Relations Committee, United States Senate, made the following statement January 12, 1931:

I do not know of a more important phase of our economic depression than that which arises out of the treatment of silver. It is estimated that the monetary stock of gold for the world is about \$10,000,000,000 or less. Of this amount 65 percent is controlled by the United States and France. In July, 1930, France had about \$1,900,000,000, the United States, \$4,516,000,000. These two nations have a population of about 170,000,000. The world population is about 1,930,000,000. So about 1,760,000,000 of the world's population must do business with about \$3,694,000,000 of gold. In other words, about 1,700,000,000 throughout the world have a gold supply of about 20 cents per capita.

These naked figures of themselves seem to me to present the unanswerable argument in favor of doing something for silver. There are at least 800,000,000 to 900,000,000 people in the world who want to use silver as money. Through long years of custom and practice they have become used to silver and they are anxious to have it. But the cruel and brutal financial policy which has dominated of late years has deprived them of an opportunity to have silver except at a most reduced value.

After England forced the gold standard upon India and India began to unload her silver upon the world, silver went from about 64 to 31 or 32 cents. The purchasing power of these millions of people was reduced by half. What we need in this country is fewer appropriations from the United States treasury and more markets for our goods. Those markets, so far as a vast amount of the human race is concerned, can be restored to a marked degree by a proper treatment of silver.

I do not believe that the United States alone, however, can solve this problem. I think it would greatly damage our cause to advocate any such theory. The silver problem is really a phase of the world's economic problem, and as such we ought to treat it. But I do believe that by the United States taking a lead we might bring about an international agreement establishing a proper ratio between silver and gold which would enable these people who want silver to use it and which they undoubtedly would do.

Francis H. Brownell, president, American Smelting & Refining Co., in a recent pamphlet on the silver question:

The fall in the price of silver of nearly 15 cents per ounce during the spring of 1930 caused a rapidly increasing demoralization

of the exchanges, particularly of China and Mexico. The United States sells to China large quantities of cotton, machinery, oil, leaf tobacco, and many other commodities.

Mexico and other silver-using countries experienced a like disastrous effect from the fall in the price of silver. The purchasing power of all silver-using countries became seriously impaired and their ability to acquire commodities of the United States and leading European countries substantially lessened.

* * * * *

The possibility of silver returning again to its former levels is largely, if not entirely, dependent upon whether the Indian government and perhaps other governments pursue the policy of throwing silver upon the market whenever prices strengthen. If this policy were stopped, it seems highly probable that silver would ultimately recover. If it continues, it is impossible to predict the final outcome.

H. H. Stevens, former Secretary of the Treasury of the Dominion of Canada in an address to the Canadian Legislature:

One billion people in the Orient, in China, in India, in the Malay States, and in Mexico are deprived of two-thirds of their purchasing power by the action of the nations. There is one reason for the agricultural and commercial depression which exists today all over the world. One-half of the human race is living below the margin of decent living. In fact, millions upon millions in China during the present year have died largely because of the inadequacy of their purchasing power.

Mark Sullivan, writing from Washington in June:

The purchasing power of all Asia is reduced by the fall in the price of silver. This in turn diminishes the purchasing power of Europe. The final net is reduced volume of international trade, including American exports. The same cause accounts, in part certainly, within Asia, for domestic disturbances, which in the case of China are described in terms of communism and India in terms of salt.

Wall Street Journal, in a survey of business conditions:

The trade with China is of vast importance to the commercial nations of the world.

With the United States alone it amounts to over \$300,000,000 a year. Indirectly its trade with the United States is much more. One instance is that of cotton. It is one of England's greatest customers for cotton goods, which England makes from American cotton. The drop in silver means that Chinese exchange must decline. The purchasing power of silver therefore reacts on all countries with merchandise to sell. China is not only a purchaser of goods but a borrower in the money markets of the world.

The Vancouver *Sun* publishes an address by R. J. Crome, its publisher, before the National Foreign Trade Council, in which he said:

China is the greatest potential trader in the world today. Its 4,000,000 square miles of territory support a population of 425,000,000. Close up, it may appear that China is hopelessly enmeshed in political squabbling, sectional wars, an economic chaos, but hold China off at a distance and it is apparent that it is unifying politically, economically, and socially. * * * Lump the Asiatic countries together and lump the billion people who live in them into a single trade unit and one has a picture of the world's new market.

S. U. Zau, director of commercial relations for the Nanking Government, is

quoted in the China press, as follows, in connection with the trade of China, as affected by the British silver policy in India:

It is the British policy, again, in India which has added so materially to the decline in the value of silver—another reason, it seems to me, why Great Britain should take the initiative in making at least an endeavor to reach some sort of international understanding for reestablishing silver as a standard basis of credit. * * *

Almost everywhere in Europe hundreds of factories are idle or working short time, and millions of men and women are without work. Why are they unemployed? Because markets can not be found for their products. And the reason those markets can not be found in many parts of the world is, not that the people who usually buy the products of European and American factories have too many of those goods already stored in their family cupboards, but because they can not afford to pay the prices asked for them.

This is particularly the case with us here in China. Owing to the terrific slump in the value of silver, we can scarcely buy from nor sell to foreign countries, and this paralysis of China's trade has its reactions far beyond the frontiers of this Republic. The price of an article manufactured in Manchester or Sheffield for sale in China becomes doubled simply because exchange compels us now to pay a dollar for what we used to get for 50 cents. * * *

If only it were possible to get concerted action taken for the stabilization of the silver market, it would be soon possible to get the trade which is now paralyzed into movement again, and this would be to the benefit not only of China but of all the countries which have commercial dealings with us.

Rene Leon, noted American authority on commerce and finance, in a statement issued September 19, 1930:

Available records running back well upwards of a century fail to reveal so low a quotation for the white metal as that which obtained in mid-June, 1930, and the improvement since that date has been purely negligible. The effect of this disastrous state of affairs on the psychology of the orientals may well be left to the imagination. Suffice to say that mass poverty breeds despair and engenders social and political evils. India and China are in the throes of just such conditions.

Dr. Julius Klein, Assistant Secretary of Commerce, in a statement to the subcommittee made on June 26, 1930:

In explanation of the considerable loss in both our import and export trade with China, three principal factors may be emphasized: (1) The renewal of extensive and energetic military activities in north central China and the Yangtze Valley throughout the first half of 1930; (2) the lower prices obtaining in world markets for many commodities, and particularly those which figure most important in China's exports; and (3) the low price of silver. These three factors, as well as minor contributing ones, all blend into the one general cause for the reduction in China's trade, i. e., the reduction in China's purchasing power brought about by them.

And again:

China, being on a silver basis, receives all of her income in China in silver, and all she receives from abroad must be paid for in silver, but upon a gold valuation. From our Table II we note that the average dollar value of the Shanghai tael in 1928 was 64.30 gold cents; in 1929, 58.42 cents; in May, 1930, 44.69 cents; and July 22, 1930, 36.74 cents. A simple way to state the problem is the obvious one that, other things being equal, China can not buy as much goods from abroad for 36 cents as it could for 64 cents.

Grover Clark, consultant on Far East-

ern Affairs in a statement issued January 13, 1931:

Millions in China made destitute by famine and civil war, now must loot to live. These are the raw material out of which the communist bands are organized and from which the huge armies are recruited. Until these people can get an opportunity to earn a modest living, peace in China will have no secure foundation, the buying power of the people will remain low, and, consequently, China will continue to be very much less of a market for American goods than it will become when peace and better economic conditions are achieved.

The Irving Trust Co., of New York, in the *Mid-Month Review of Business* for December, 1930:

Inasmuch as China is on a silver basis, her purchasing power in terms of imports has been melting away and thus American sales have woefully declined. In addition, the Chinese are suffering from a world-wide decline in the gold prices of the commodities which they export. It seems safe to infer that the silver catastrophe has been a major factor in the unrest in India and economic crisis in China. If so, the full effects of the situation have not yet been witnessed.

Department of Commerce Report of February 4, 1931:

The silver situation continues to be the all-absorbing topic of interest in Shanghai business circles. * * * The outlook is thus uncertain and, combined with continued instability, is reflecting unfavorably upon both the import and export trade.

John Brisben Walker, writing in the *New York Times* says:

The effect on India and China will never be known in its fullest horror. The immediate depreciation of the only stock of money, silver, stopped trade and starved whole provinces. It caused millions of deaths.

J. F. Darling, director of the Midland Bank of London, in an address before the Royal Empire Society of London:

Gold has been accorded a value more than 60 times that of silver today. Despite the fact that the relative production of the two metals has been what it now is for the last four or five centuries. Over that long period, only 14 ounces of silver have been produced for each ounce of gold. That proportion has showed no change for the last five years, but in the same length of time the price of silver has fallen from 64 to 28 cents an ounce.

This has been terrific in its effect on the purchasing power of a billion people in the world which in return reacts against another billion. * * * We are fools to put up with it. Common justice, common humanity, and common sense urgently demand that the British Empire take the lead in restoring the equilibrium of gold and silver on which the economic structure of the world rests.

E. Kann, international authority on the currencies and finances of China:

The sale by governments had a doubly harmful consequence. First, because extra quantities of silver were thrown on the market, irrespective of whether, when, or where these were wanted; and second, the baneful psychological effect caused by the uncertainty, or rather the certainty, of more coming in the near future. This has been a huge black cloud overshadowing the silver market like the angel of death.

STATEMENT FROM INDIA

Mr. Chunilal Mehta, of India, addressing the annual meeting of the Bombay Bullion Ex- (Continued on page 173)

NEWS OF THE MINING FIELD

Investigation of Lead Production Costs Started

The United States Tariff Commission has instituted an investigation under section 332 of the tariff act of 1930, for the purpose of ascertaining the differences in cost of production during 1928, 1929, and 1930, between foreign articles and domestic lead ores and metallic lead in various forms, including certain manufacturers. These articles (except ores imported for smelting in bond and exportation) are dutiable, under paragraphs 391 and 392 at the tariff act.

This investigation is instituted pursuant to Senate Resolution 441, adopted on February 17, 1931, and introduced by Senator King of Utah. The investigation will embrace mining, concentrating, smelting, and refining operations, and possibly other phases of the industries, and the report resulting therefrom is to be submitted to the Senate. The section of the tariff act under which this investigation is ordered provides the Tariff Commission with a number of general powers among which is that of ascertaining conversion costs and costs of production of domestic and foreign articles in the principal producing centers in the United States and foreign countries.

The commission will not make and is not expected to make any recommendations with respect to rates of duty.

New Mining Research Project at Battelle Institute

The trustees of Battelle Memorial Institute, Columbus, Ohio, announce the establishment at the institute of a research project sponsored by the Calumet & Hecla Consolidated Copper Company, of Calumet, Mich. The purpose of this project is to make a fundamental study of arsenical and argentiferous lake copper in respect to its properties and application to industrial uses.

It has long been recognized that copper containing small amounts of arsenic and silver has definite, well-defined advantages and recent development have

forcibly brought to mind the possibilities of further industrial applications. This research program is comprehensive in character and is a most promising and fertile field.

G. L. Craig has been added to the institute staff for work on this project, which is under the direct supervision of Dr. H. W. Russell and J. L. Gregg. Mr. Craig was formerly Research Fellow with the U. S. Bureau of Mines and more recently metallurgist for the Fairmount Aluminum Company.

Freeport Texas Company in Manganese Deal

The Freeport Texas Company has purchased a controlling interest in the Cuban American Manganese Corporation, which owns extensive manganese deposits in Cuba about 10 miles north of the port of Santiago. This transaction, which puts Freeport Texas, a sulphur company, into the manganese business, was announced February 19.

Manganese imported from Cuba is free from duty under the treaty entered into with Cuba in 1902. Other foreign manganese ores have been subject to a duty since 1922.

Plans call for the immediate construction of a plant in Cuba to treat 1,000 tons of ore daily by new patented processes of concentration. The processes, which, it was announced, have been successfully tested commercially, were perfected by engineers of Freeport Texas and the B. F. Goodrich Company in collaboration with metallurgical laboratories.

The proposed new plant in Cuba will have an initial capacity of 100,000 tons of ore yearly, with a metallic manganese content of about 50 percent. The plant will begin production within a year, it is expected.

The Cuban-American Manganese Corporation controls five principal areas of manganese properties comprising 10,000 acres in Oriente Province, within a radius of 25 miles of Santiago. These deposits are adjacent to the main line of the Cuban Railway.

This acquisition fits in with the Freeport Texas Company's major operations, according to E. L. Norton, president of the Freeport Texas Company.

Bunker Hill Options 17 Claims in Metaline District

The Bunker Hill & Sullivan Mining and Concentrating Company has taken an option and bond to purchase 340 acres embracing 17 claims in the Metaline mining district in eastern Washington, according to an announcement by Stanley A. Easton, general manager of the Bunker Hill.

For some time mining engineers of the Bunker Hill staff have been in the Metaline district conducting an exhaustive investigation. The surface showing is said to be impressive, and the Bunker Hill's entry into this new territory was learned of with delight by mining interests throughout the Metaline district.

In speaking of the deal, Mr. Easton said: "The deal involves \$200,000 for the property, with payments to cover four years. We will start from 8 to 12 men doing preliminary surface work with a view to mapping out a program of development as soon as the snow is off the ground. There is no development at depth in the territory in spite of the promising character of the extensive croppings.

"The claims we have tied up are on Slate Creek, in the Lead Hill country, 12 miles northeast of Metaline Falls."

Canadian Mineral Production Registers Decrease

The Dominion Bureau of Statistics has estimated the value of Canadian mineral production in 1930 at \$276,865,000—a decrease of 11 percent from the record output attained in 1929. The reduced production in 1930 was largely accounted for by drastic declines in metal prices and by lower outputs of many of the non-metallic minerals and structural materials. During the year just closed, new high levels were established in the quantity and value of gold, petroleum, and natural gas, while the quantity of copper and zinc produced was greater than in any previous year. Metals, valued at \$143,124,000, decreased from 1929 by 7 percent; fuels, \$68,696,000, declined by 10 percent; other metallic minerals, \$15,382,000, were 27 percent less; and structural materials, \$49,663,000, showed a loss of 15 percent.

Mining School Preparing Elementary Mining Textbook

The mining department of the Michigan College of Mining and Technology at Houghton is making progress in the preparation of an elementary mining textbook. The preliminary chapters have been completed.

The entire mining department of the college is assisting in the work of writing the book, under the supervision of Prof. C. H. Baxter, head of the department.

The book will include the subjects of mine organization, management and accounting; prospecting, drilling and mine development; methods of mining and hoisting; accidents, safety and legislation; geological occurrence of ores and their geographical distribution; and a number of topics not as yet definitely assigned.

Some Interesting Notes on Hoover Dam

Hoover Dam which will store enough water to cover the State of New York to a depth of one foot, 11 times as much water as Elephant Butte Dam in New Mexico stores, and 12 times as much as is stored by the Assuan Dam on the Nile in Egypt, will be completed in six and a-half years, according to estimates issued by the Bureau of Reclamation.

The statement goes on to explain that Congress in 1930 appropriated \$10,660,000 and the present appropriation bill carries an additional \$15,000,000. The contract for the dam and tunnels will involve close to \$50,000,000 and will be one of the largest ever let in this country.

The tunnels are to be finished in two years, the dam in six and one-half years. Considering its magnitude it has very few elements of uncertainty for the contractor. The Government is to buy and furnish cement and structural steel; the contractor therefore assumes no risk from fluctuations of prices. The four tunnels which will carry the river past the dam during its construction have been so thoroughly prospected by means of diamond drill cores that contractors know the kind of material to be removed.

The cofferdam which will divert the river through the four tunnels is the one hazardous feature of the project. It is to be built according to plans provided by the Reclamation Bureau, and when so built all subsequent hazards of its failure or being overtopped by floods are assumed by the Government.

The power machinery is to be provided by the contractors for power. Owing to its size it will be something of a problem to install it, but some of the contractors have for a year been studying the situation and have already designed their equipment. It will have the highest towers of any work ever undertaken and the overhead cables will lift 30 to 40 tons.

A. I. M. E. HOLDS 140th MEETING

The American Institute of Mining and Metallurgical Engineers held its 140th annual meeting in New York, February 16 to 19, with a program which deservedly commanded the interest and participation by the 1,300 delegates attending.

Robert E. Talley, vice president and general manager, United Verde Copper Company, was elected president of the Institute. Other officers elected are:

Vice president, Howard N. Eavenson, Pittsburgh, Pa.; second vice president, H. A. Guess, vice president and managing director, American Smelting and Refining Company, New York; and directors, Louis S. Cates, Karl Eilers, S. R. Elliott, H. G. Moulton and William Wraith.

The annual award of medals, cash prizes and honorary memberships was made February 18, at the dinner and reception at the Hotel Commodore. The William Lawrence Saunders gold medal, awarded to President Hoover in 1928, was awarded to Francis W. MacLennan, general manager of the Miami Copper Company, Miami, Ariz., for his work on the mining of low-grade copper ores. William H. Peirce, president of the Peirce-Smith Converter Company of Baltimore, received the James Douglas medal for "distinguished service in non-ferrous metallurgy."

Edmund S. Davenport, of the research staff of the United States Steel Corporation's laboratory at Kearny, N. J., received the Robert W. Hunt cash prize for his studies with cast iron, tungsten, thorium and the transformation of austenite at constant subcritical temperatures. Dr. Waldemar Lindgren, head of the geology department, Massachusetts Institute of Technology, was made honorary member of the institute.

In introducing Mr. MacLennan, the recipient of the Saunders award, Scott Turner, director of the U. S. Bureau of Mines, stated:

"This award is made each year, for distinguished achievement in mining. As it was established in 1927, it has gone to but four men—Brunton, Hoover, Hammond, and Jackling. These are well-known names of eminent engineers. Tonight we enroll the fifth name—one which adds brilliance to the list.

"We are aware that Mr. MacLennan has practiced his profession creditably in various parts of Canada, Peru, and the United States. Naturally, we know him best for his most recent achievement, at Miami, Ariz., where with remarkable success, he mines large tonnages of low-grade copper ore, using his own ingenious method of block-caving. His Miami record alone would identify him as a conspicuously skillful, courageous, and resourceful mine operator.

"At Miami, daily production through one shaft has been as high as 18,000 tons, tonnage per man-shift underground has reached 21, and powder consumption has decreased to less than one-fourth of a pound per ton of ore produced. Other operating figures are equally noteworthy. Milling costs have been lowered to less than 30 cents per ton; in fact, our mining metallist is nearly as good a millman as he is a miner."

The Penrose medal was awarded at a dinner by the Society of Economic Geologists at the Princeton Club, February 17, to David White, senior geologist of the United States Geological Survey.

Several sessions were held each morning and afternoon for the consideration and discussion of various subjects, at times as many as half a dozen meetings going on at the same time. Including the various luncheon meetings, dinners and entertainments, there were more than 70 separate gatherings.

Two sessions on geophysical prospecting, held the morning and afternoon of February 16, attracted considerable attention. Discussions and demonstrations were given on the use of instruments for scientific prospecting. Bela Low, Sherwin F. Kelly, and W. B. Creagmile gave a laboratory demonstration of the use of the "Megger," an instrument about the size of a portable typewriter, by means of which it is claimed information can be gained about rocks and rock formations below the surface of the earth. Noel H. Stearn, of St. Louis, discussed and explained the use of the Hotchkiss "Superdip," by which he claimed eight different natural resources in seven states has been identified. Hans Lundberg and Theodor Zuschlag presented "A New Development in Electrical Prospecting," the "Racom," developed by Mr. Zuschlag.

Methods used in the construction of the 21-mile Yonkers-Brooklyn water tunnel to give Brooklyn a source of water supply independent of Manhattan were described in a talk by Theodore Marvin, editor of *Explosive Engineer*, at the "Mining Methods" session Monday morning. His talk covered in all 33 tunnels in 15 states and eight foreign countries.

Cooperation instead of competition among 300 of the larger coal companies would make the bituminous coal industry prosperous, the coal division was told, at a luncheon at the Engineers' Club, February 16, by C. E. Bockus, president of the National Coal Association, who expressed a hope that some day the Federal Government might make such cooperation possible "by freeing the industry from unreasonable restraint."

"Coal," Mr. Bockus said, "has completely deflated in this country its own selling price. We are back on many

grades to pre-war prices. Slack of good quality has been sold within the month not only for less than cost but almost for less than the royalty due to the property owner. Millions of tons are sold for far less than the labor cost alone.

"We are to have a market for somewhere between 460,000,000 and 530,000,000 tons. On that we have to live or die. Without better realization we must die.

"The coal man can never expect Government help such as has been tried for the farmer. But might it not be reasonable to expect that some day there may be a freeing from the unreasonable restraint of the industry so that there could be cooperation that would adjust supply to demand and secure an economic return for a great natural resource?"

A "clinic" on engineering education was held during the afternoon.

A comprehensive survey of the world's gold supply, past and present, and the outlook for the future, was presented in a series of papers at the gold supply symposium, held Tuesday afternoon, February 17.

Robert J. Grant, director of the United States Mint, in a paper on "Sources and Trends in Gold Production," read in his absence by John W. Finch, dean of the School of Mines at the University of Idaho, told how the production of gold is again mounting throughout the world after the decline that set in after the World War, while the United States has fallen behind other major gold-producing countries.

"Our percentage of new-world supply," Mr. Grant's paper said, "has declined to a point where this country may no longer occupy second place as a world gold-producer, a rank we have held for two decades. Final figures for 1930 may place Canada second, with the United States third."

George E. Roberts, vice president of the National City Bank, emphasized the declining use of gold as currency in the face of the increasing utilization of credit. Only a small fraction, he said, of the gold reserves of the great banks of issue throughout the world ever leaves those banks, and the chief use of gold is in the settlement of balances, mostly international.

Consequently, Mr. Roberts added, whether the world suffers a scarcity of gold or not, business and industry will adjust themselves to the new condition by further development of credit.

Stabilization of the value of silver at a definite ratio to gold, through international cooperation "to relieve the present strain upon gold," was advocated by

A. C. Milner, mining engineer of Salt Lake City, whose paper on "Gold Supply in its Relation to Currencies and World Commerce," was read in his absence by Professor D. H. McLaughlin of the Harvard Mining Engineering Department.

A paper by George E. Collins, Denver mining engineer, was read by J. T. Singewald, Jr., of Johns Hopkins University.

"By 1940," the paper said, "there will be a substantial decrease in the rate of gold production and the decrease will become acute by 1945. With the estimated increase in the need for gold placed at 3 percent a year we have reason to believe that gold production will be insufficient to meet the needs of the future. I am pessimistic as to the ability of gold to continue to play its present role in our economic life."

L. C. Graton, professor of mining geology at Harvard, who returned recently from a tour of the world's gold production centres, said he saw no reason for pessimism, calling attention to the constant shift in the standing of nations as gold producers.

A. C. Daman, of Denver, proposed the use of an "international dollar," half silver and half gold, with a hole in the centre to distinguish it from other coins. This proposed coin, he said, would serve as a standard monetary unit in any part of the world.

Development in Germany of a new microscope for use in metallography that will achieve images at twice the present limits and will bring about some revolutionary advances in man's efforts to penetrate the infinitely small realms of matter was announced February 18 by F. F. Lucas, metallurgist and microscopist of the Bell Telephone Laboratories, during the Howe Memorial Lecture. Mr. Lucas is known for the development of a special ultra-violet microscope, which magnifies objects up to 6,000 times, and has made possible several noteworthy discoveries in metallurgy and biology.

Mr. Lucas illustrated his lecture with a series of photographs, taken with his ultra-violet microscope, which included pictures taken of steel surfaces magnified 3,500 times.

The use of sawdust to replace sand as an aggregate in concrete in this country was predicted by H. Herbert Hughes, assistant mineral economist of the United States Bureau of Mines, during the course of a paper at the non-metallics session. "In Europe," he said, "sawdust concrete and sawdust-diatomite cement tile are used rather extensively because of low cost and light weight."

The annual Institute of Metals lecture was delivered February 19 by Dr. Arne Westgren, of the University of

Stockholm, Sweden, secretary of the Nobel Prize Committee on Physics and Chemistry. The subject was "X-Ray Determination of Alloy Equilibrium Diagrams," and dealt with the most recent advances made in the use of the X-ray to determine the inner structure of such alloys as steel, brass and chromium.

The dependence of the lead and copper industries upon the expansion of telegraphic and telephonic communication and power transmission was stressed by Dr. G. W. Thompson, chief chemist of the National Lead Company, in an address at a dinner of the Institute of Metals Division.

Western Metal Congress and Exposition at San Francisco

The Western Metal Congress and the Western Metal and Machinery Exhibition was held at the Exposition Auditorium in San Francisco, Calif., February 16 to 20, 1931.

Headquarters for the congress were at the St. Francis Hotel and technical sessions were held at the hotel and at the auditorium.

Technical papers, sponsored by the various participating societies, covered a broad and comprehensive scope of subjects.

The Exposition Auditorium was filled with most interesting displays of metals and machinery, which were viewed by a continuous crowd of interested persons. There were more than 150 exhibitors. Metal displays showed the full range of special alloys and their various uses. The machinery division had a wide variety of intricate machines, many of them in operation. Displays of shop and foundry practice and equipment ranged from the old-time, hand-operated blacksmith shop to the most modern machine shop.

Inspection trips to a number of industrial plants in the bay region were arranged for visiting engineers. These included the Merco Nordstrum Mfg. Co., Rheem Mfg. Co., Hall-Scott Motor Car Company, Byron-Jackson Company, Pacific Gear and Tool Works, California Saw Works, American Can Company, Pacific Foundry Company, Pelton Water Wheel Company, Pacific Coast Steel Company, Western Pipe and Steel Company, Bethlehem Shipbuilding Corp., Pacific Electric Mfg. Co., and the Link Belt Co.

On Thursday evening, February 19, the officials and guests were feted at a dinner dance at the Hotel St. Francis.

The cooperating societies and associations which made the congress and exposition possible were the American

Chemical Society, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Society for Testing Materials, American Society for Steel Treating, American Welding Society, Institute of Metals, National Purchasing Agents Association, Pacific Coast Electrical Association, Pacific Coast Gas Association, and Society of Automotive Engineers.

Fourth Annual Mining Institute of College of Mines, University of Washington, Seattle

The fourth consecutive Mining Institute, annually held under the direction of the College of Mines of the University of Washington, was concluded on January 24 with a registered attendance of 168. This attendance, although considerably lower than last year, indicated a continued interest in the program offered by the institute. As before, the attendance represented a cross-section of persons interested in various phases of mining, metallurgy, and ceramic engineering.

The speakers, other than members of the mining faculty of the university, were J. L. McAllen, A. E. Anderson, S. H. Ash, Robert M. Betts, N. D. Moore, D. A. Pifer, Van. H. Smith, R. J. Spry, and E. A. White.

A joint meeting of the North Pacific Section, American Institute of Mining and Metallurgical Engineers, and the Mining Institute was held during the week, at which time N. D. Moore, vice president of the Pacific Coast Coal Company, presented an analysis of the fuel situation in the Pacific Northwest under the title of "Trends of the Fuel Industry." Van H. Smith spoke at a luncheon meeting of the student Mines Society on "Korea, a Mining Opportunity," in which he gave an interesting summary of his experiences a year ago in Korea.

Members of the faculty of the College of Mines devoted the morning hours of the session to lectures:

Dean Milnor Roberts—"Mining Methods and Costs," "Ore Testing," "The Mineral Resources of the Pacific Northwest."

Dean Henry Landes—"The Geology of Washington."

Prof. Joseph Daniels—"The Mineral Industry of Washington."

Prof. C. R. Corey—"Metallurgy of Some of the Common Metals," "The Microscopic Examination of Metals," "The Assay and Purchase of Gold Bullion."

Prof. Hewitt Wilson—"The Occurrence and Properties of Clays," "Development of Non-Metallic Minerals," "Refractory Raw Materials and Products."

Prof. George E. Goodspeed—"The Mineralogy of the Rarer Mineral Substances."

Prof. J. Grattan O'Bryan—"The Laws of Mining."

In the afternoon the various laboratories of the college were open for demonstration. Dr. Milnor took charge of the mining and ore dressing laboratories and demonstrated the use of the equipment in both lines of activity, particularly stressing the testing of ores. One afternoon was devoted to a demonstration of the methods of conducting float-and-sink tests on coal, and the actual operation of a full-scale test on one of the local coals employing a commercial coal-washing table. Another afternoon was devoted to explanation of assay methods and the examination of metals by microscopic methods.

The sessions concluded with a trip to the Tacoma smelter, where members of the operating staff conducted the party through the plant, outlining the various steps from the receipt of ore and blister copper to the final shipment of finished product as electrolytic copper.

One of the interesting events of the week was a radio talk given by Dean Milnor Roberts on "The North Pacific Mining Field," and one by Mr. Eugene A. White on the "Story of Copper."

Senate Requests President to Call International Silver Conference

A resolution suggesting that President Hoover negotiate with other governments to obtain suspension of their policy of debasing silver coin and selling silver on the world market, and proposing he call an international conference to agree on the use of silver as money, was adopted by the United States Senate on February 20.

The resolution was drafted by the Senate Foreign Relations Committee on the basis of a report from a subcommittee which studied the silver problems and the question of trade with China for nearly a year.

The Senate sent to the President along with the resolution the subcommittee's complete report, in which it found the depressed price of silver one of the major causes of the world depression.

The subcommittee recommended that the first step in restoring the price of silver was suspension of Great Britain's policy of dumping Indian silver.

It recommended that an international conference on the uses and status of silver as money, discuss a long-range plan for stabilizing the price of the metal.

The low price of silver, the subcommittee said, was the chief cause of the decline in trade between this country and the Orient and South America.

Silver Output Shows Sharp Drop for 1930

Production of silver by the six leading countries in 1930 showed a sharp decline from totals in recent years, according to a report issued by the American Bureau of Metal Statistics. The bureau reported production of the United States, Canada, Mexico, Peru, Australia and Burma, which produced 87 percent of the world's production in 1929, as 211,428,000 fine ounces, compared with 227,880,000 ounces in 1929, 222,367,000 ounces in 1928 and 218,430,000 in 1927.

By countries the production for 1930 was as follows: United States, 50,234,000 ounces; Canada, 23,447,000; Mexico, 105,205,000; Peru, 16,634,000; Australia, 8,854,000, and Burma, 7,055,000 ounces.

World's Production of Crude Petroleum in 1930

The world's production of crude petroleum during 1930 reached a total of 1,418,723,000 barrels, a decrease of 65,318,000 barrels, or 4 percent, from the total of 1,484,041,000 barrels recorded for 1929, according to preliminary figures compiled by the Bureau of Mines. United States production dropped from 1,007,323,000 barrels in 1929 to approximately 898,000,000 barrels in 1930, a decline of about 109,000,000 barrels, or 11 percent. Production in countries other than the United States, however, increased from a 1929 total of 476,718,000 barrels to 520,723,000 barrels in 1930, an increase of 44,005,000 barrels, or 9 percent. United States production, consequently, accounted for 63.3 percent of the world's total, the lowest ration since 1921.

Based on annual totals, Venezuela held its position as the second largest producing country, with Russia (U. S. S. R.) in third place. Venezuelan production held very closely to the 1929 figure, but production in Russia reached a total of 135,165,000 barrels, an increase of 31 percent over the 1929 calendar year estimate of 103,000,000 barrels. During the latter part of 1930, it is reported, monthly production in Russia exceeded that of Venezuela. Persia, Roumania and the Netherland East Indies all recorded increased production, while the decline in Mexican production continued, with the result that Mexico dropped from fourth to seventh place among the world's oil-producing countries, with Persia succeeding Mexico in the fourth position and followed in order by Roumania and the Netherland East Indies. Among the smaller producing countries Germany made the most marked advance, its production exceeding a million barrels for the first time in the post-war period. Bolivia was added to list of crude oil-producing countries during 1930.

Coal Conference Favors Strengthening of Trade Practice Bureaus

Representatives of seven southern coal bureaus, at a meeting in Cincinnati, held Thursday, February 12, adopted a resolution urging that the trade practice movement be established or strengthened in every producing field in the country because of the vast beneficial effect of the elimination of the various unfair practices set forth in the several codes. The conference recommended frequent bureau meetings in each field, to be attended by the chief executives of producing companies, and the appointment by each bureau south of the Ohio River of a member and an alternate to serve on a general committee, representing the southern bureaus, which shall hold monthly meetings for the purpose of reviewing the situation in each field and charting a program.

The first meeting of the general committee mentioned above will be held at Cincinnati March 16. Every one present at the February meeting voiced the view that it would be a calamity to the industry should the movement be discontinued. Numerous accomplishments of the bureau program, including abandonment of consigned coal, were cited. D. A. Thomas, of Birmingham, Ala., chairman of the Trade Practice Section of Market Research Institute of the National Coal Association, presided, and C. C. Dickinson, of Charleston, W. Va., acted as vice chairman of the conference.

The bureaus represented were: Alabama Coal Exchange, Harlan Coal Bureau, Hazard Coal Bureau, Kanawha Coal Bureau, Southern Appalachian Coal Exchange, Virginia Coal Bureau, Williamson Coal Bureau.

Representing the Elkhorn field in Kentucky, which has no trade practice bureau, were Burke H. Keeny, manager, Middle West Coal Co., Cincinnati, Ohio, and H. LaViers, general manager, North-East Coal Co., Paintsville, Ky. Representatives of the West Kentucky Bureau were unable to attend the conference.

Hazard Coal Operators Meet to Consider Trade Practice Movement

A general meeting of the coal operators of the Hazard field, whether members of the Hazard Coal Operators' Exchange or not, was held in Cincinnati, Ohio, on February 27. Approximately 90 percent of the tonnage of the field was represented at the meeting.

The purpose of the meeting was to decide upon their future procedure with reference to the continuation of their trade bureau with its fair trade practice code and its relation to other fields in the matter. The operators were enthusiastic in favor of the maintenance of a fair trade practice bureau but felt that the movement would be much more helpful if other neighboring fields pur-

sued the same policy. The operators authorized the appointment of a committee of three to attend the general meeting of the Southern associations to be held at Cincinnati on March 16 for the purpose of promoting the trade practice movement.

George Dunglinson Elected President Williamson Association

At a meeting of the executive committee of the Operators' Association of Williamson Field, held February 3, George Dunglinson, Jr., manager, Fuel Department, Norfolk & Western Railway Company, Bluefield, W. Va., and E. E. Ritter, general manager, Red Jacket Consolidated Coal & Coke Company, Red Jacket, W. Va., were elected president and vice president, respectively. Mr. Dunglinson was elected vice president, W. A. Richards, who resigned because of his holding similar office with the Winding Gulf Association and because of the demands on his time due to the recent organization of the Sovereign Pocahontas Company, which distributes coals produced by his mining companies and those of the Stephenson interests of Roanoke, Va. Mr. Ritter was elected vice president in place of J. W. Mayhew.

R. H. Buchanan Heads New Anthracite Enterprise, Combining Three Large Companies

What is said to be one of the largest independent producing companies in the anthracite field was organized February 2 at Philadelphia. The new company is the Penn Anthracite Colliers Company and R. H. Buchanan has been named as president.

With the merger of properties, equipment and facilities of the South Penn Collieries Company, the Elk Hill Coal & Iron Company and the Southern Pennsylvania Anthracite Company, the new organization will have an annual producing capacity of more than 2,000,000 tons and will employ approximately 4,000 men.

Under the new system of operation two corporations are organized—the Penn Anthracite Collieries Company, which will be the holding company, and the Penn Anthracite Mining Company, the operating company.

Collieries included in the new enterprise are the Von Storch, Leggett's Creek, Capouse, Johnson, Ontario, Raymond, and Riverside in the Scranton division and the Randolph at Port Carbon, Pa.

The official personnel which will direct the management of both companies is as follows:

President, R. H. Buchanan, Scranton; vice president, James J. Lee, New York; secretary-treasurer, Willard M. Burrus,

Scranton; assistant treasurer, William F. Brandamore, Scranton; assistant secretary, Frederick H. Schroeder, New York.

The board of directors of the new company is composed of the following: Robert K. Cassatt, Philadelphia; Frank C. Wright, James J. Lee, New York; Charles Dorrance, Scranton, and Mr. Buchanan.

The holding company acquired possession of the South Penn operations at receiver's sale conducted recently, buying in the properties for \$900,100. The Elk Hill properties were secured by an exchange of stock.

The financing of the new concern has been accomplished by the issuance of \$1,000,000 in first mortgage bonds. Common stock of no par value, to the amount of 100,000 shares, is authorized under the charter, as are 22,551 shares of preferred stock of no par value. Holders of South Penn Collieries Company first mortgage bonds will have the option of exchanging the bonds, each of \$1,000 denomination, for six shares of preferred stock and four shares of common stock of the new company. Lee, Higginson and Company and Cassatt and Company have underwritten the issues.

Mr. Buchanan has conducted the business of the South Penn Collieries Company during the past three years. Taking charge of the South Penn operations as a government receiver when the affairs of that company were hopelessly muddled, he successfully brought the company through a receivership, built for a high reputation among anthracite producers and made it the keystone for the new system of operations. It is understood that Mr. Buchanan will also continue as the executive head of the Northumberland Mining Company.

The newly organized company has announced the appointment of W. H. Lesser as combustion and mechanical engineer. Much of Mr. Lesser's time will be devoted to the sales of this company's coal, making available a service, including plant and combustion engineering, heater service, advertising and sales promotion.

Since 1917, Mr. Lesser has worked in the operating department of Madeira, Hill & Company's anthracite mines as mechanical engineer. Under the direction of E. H. Suender, vice president and general manager of these properties, he has done extensive work in the preparation of coal for market. This work consisted of remodeling their various breakers and improving the preparation of the coal, and it culminated in the recent completion of the Colonial Breaker, in which the sand flotation system of coal preparation was adopted. His work in electrical engineering is represented by the complete electrification of that company's properties.

John R. Doolin Executive Secretary Utah Association

John R. Doolin, general manager of the National Coal Company at Salt Lake City, has been selected executive secretary of the Utah Coal Producers' Association, to succeed Oliver J. Grimes, recently appointed managing director of the committee of ten and manager of the Chicago office of the National Coal Association. Mr. Doolin has been prominent in the Utah coal industry for more than a quarter of a century, having served in the operative, financing, accounting and sales branches of the industry. Prior to his connection with the National Coal Company, he was general auditor of the Standard Coal Company, also of Salt Lake City. He is a native of Illinois.

Coal-Mine Fatalities in 1930

During the calendar year 1930 there were 2,014 deaths in and about all coal mines in the United States, according to the latest reports received by the Bureau of Mines. With a production of 531,432,000 tons of coal the death rate was 3.79 per million tons. It is probable that the present total of 2,014 deaths will be increased slightly on account of some injuries in 1930 which will terminate fatally in 1931. Past experience has shown that final figures are about 3 percent higher than those available immediately at the close of the year. This would indicate that the death rate of 3.79 for 1930 might be later revised to 3.90. With this rate may be compared a rate of 3.59 for 1929, during which year 2,187 fatalities occurred and 608,817,000 tons of coal were produced. Thus it will be seen that while the year 1930 showed an actual reduction in the number of fatalities from accidents, it showed a proportionately larger decrease in the production of coal, so that the death rate per million tons of coal was higher in 1930 than in the preceding year. This was also true when considering bituminous mines alone. Anthracite mines, however, had a lower death rate in 1930 than in 1929. The rate for bituminous mines in 1930 was 3.41, based on 1,574 deaths and 461,630,000 tons, as compared with 3.19 for the year 1929, based on 1,705 deaths and 534,989,000 tons. For anthracite mines in 1930, the records showed 440 deaths, 69,802,000 tons and a fatality rate of 6.30, as compared with the 1929 record which showed 482 deaths, 73,828,000 tons and a rate of 6.53.

There was one major disaster—that is a disaster in which five or more lives were lost—during December, 1930. This was an explosion at Madrid, N. Mex., on December 6, which caused five deaths. On December 29 five small boys lost

their lives by suffocation in an abandoned mine at Southside, Pa. This unfortunate disaster is not classed as a mine accident, chargeable to the accident record of the coal industry, as the boys were in no way connected with mining; the accident has, however, resulted in the suggestion that openings to abandoned mines be barricaded, in order to prevent a similar tragedy.

During the entire year, 1930, there were 12 major disasters in which a total of 225 lives were lost. This figure does not include three visitors who were killed in an explosion at Millfield, Ohio, in November. In 1929 there were seven major disasters with a resulting loss of 151 lives. Included in these figures are five deaths from a fall of roof in 1929 and eight deaths in a fall of roof in 1930. Based exclusively on these major disasters the fatality rates per million tons of coal produced during the two years were 0.423 in 1930 and 0.248 in 1929.

A comparison of the accident rates for the calendar years 1930 and 1929 shows a reduction in the death rate from haulage accidents. The rates for explosives were practically the same in both years, while the rates for the other principal causes of accidents were higher in 1930.

Two DeBardeleben Mines Make Excellent Safety Records in 1930

The Empire mine of the DeBardeleben Coal Corporation, Empire, Ala., operated through the year 1930 without a lost-time accident to any of the approximately 135 negro men employed in it, there being but one no-lost-time accident. The mine did, however, have 10 lost-time and 21 no-lost-time accidents to the white employees, the total days lost being 9,697. The tonnage of the mine was 225,112 and man-hours worked 800,611.

The Hull mine of the DeBardeleben Coal Corporation had but one lost-time accident in 1930, resulting in seven lost days, total tonnage being 175,332, and man-hours worked 470,680. This mine had but three lost-time accidents in 1929, with a total of 21 days lost, tonnage being 144,878, and man-hours worked 264,856. There were no fatalities during either year. This mine has a record of having worked 11 months and 20 days without a lost-time accident.

Douglas Millard Director and Vice President of National Coal

Douglas Millard, manager of fuel sales of the Colorado Fuel & Iron Company, Denver, has been elected a member of the board of directors and a vice president of the National Coal Association, succeeding J. F. Welborn, chairman of the board of directors of the Colorado Fuel & Iron Company.

Harry N. Taylor With United Electric Coal Companies

Announcement has been made that as of March 1, 1931, Harry N. Taylor will become chairman of the board and general manager of the United Electric Coal Companies, Danville, Ill., and will retire from the active management of the United States Distributing Corporation and its subsidiaries. Mr. Taylor is a former president of the National Coal Association. He has had extensive experience in the bituminous industry. His office will be 17 Battery Place, New York City.

Michael Gallagher Elected Chairman of Board of U. S. Distributing Corporation

At a meeting of the Board of Directors of the U. S. Distributing Corporation, New York City, held February 27, Michael Gallagher, president of the Pittston Company, New York, was elected chairman of the board and Wm. G. Bernet, president. These appointments are to fill the unexpired term caused by the resignation of Harry N. Taylor, who, on March 1, becomes chairman of the board and general manager of the United Electric Coal Companies, with operations in Illinois and Indiana.

Mr. Gallagher was also selected chairman of the board and president of the Sheridan-Wyoming Coal Company, at a meeting of the board of directors of that company held the same day. The offices of this company are in New York and its operations in Wyoming. Other officers are: E. P. Fitzgerald, vice president; J. E. Lee, secretary; J. R. Friel, treasurer, and Guy E. Stewart, and J. T. Kessinger, assistant secretaries.

W. L. Robison Reelected Head Eastern Ohio Association

At the annual meeting of the Eastern Ohio Coal Operators' Association held this week at Cleveland, President W. L. Robison, vice president of the Youghiogheny and Ohio Coal Company, was reelected, as were the following: Vice president, R. L. Ireland, Jr., vice president, Hanna Coal Company; treasurer, E. S. Willard, general manager, United States Coal Company, and secretary, D. F. Hurd. All officers are at Cleveland.

J. P. Williams, Jr., Heads Koppers Coal

Announcement has been made of the elevation of J. P. Williams, Jr., to the presidency of the Koppers Coal Company, Pittsburgh, Pa., to succeed H. B. Rust. P. C. Thomas, manager of mines of that company, has been chosen vice president to succeed Mr. Williams.

L. T. Dee Heads Southern Wyoming Association

At a regular meeting of the Southern Wyoming Coal Operators' Association, held recently in Rock Springs, Wyo., L. T. Dee, president of the Ideal Coal Company, Ogden, Utah, was elected president to fill the unexpired term of the late P. J. Quealy. Forrest Richardson, vice president of the Megeath Coal Company, Omaha, Nebr., was chosen vice president to succeed Mr. Dee. The board of directors is composed of L. T. Dee, Forrest Richardson, A. N. Fancher, vice president of the Colony Coal Company, Denver, Colo.; R. Y. Gibson, general manager of the Lion Coal Company, Rock Springs, Wyo., and William Redshaw, general superintendent, Megeath Coal Company, Rock Spring, Wyo. Messrs. Dee, Fancher and Gibson comprise the executive committee of the association. The regular election of officers takes place at the annual meeting held on the second Tuesday of July each year.

F. S. Landstreet Dies

Fairfax Stuart Landstreet, chairman of the Board of the Pennsylvania Coal and Coke Company, died of heart disease February 5 at the Union Memorial Hospital in Baltimore. Mr. Landstreet was 69 and was widely known in commercial and industrial circles. Early in life he became connected with the Davis & Elkins coal mining and railroad interests in West Virginia and throughout his business career was identified with the coal and railroad industries. He was an executive officer at various times with the Western Maryland Railway, Davis Coal and Coke Company and the Consolidation Coal Company. During the war he served overseas with the Red Cross. A daughter, Mrs. Herman Pieck, survives. Funeral services were conducted in the chapel of St. Bartholomew's Church, New York, with burial in the family mausoleum in Southampton Cemetery, Southampton, Long Island.

Polish Government to Control Coal Industry

Control of the Polish coal industry, trade and supplies has been vested in the Polish Minister of Industry and Commerce for a period of three years by a recent presidential decree, states a report to the Department of Commerce.

Authorization to issue regulations and orders pertaining to the turnover at the mines, exportation of coal in general or of special kinds, formation of organized coal companies for the purpose of regulating exportation and sale of coal, and the distribution of district contingents in case of a shortage to provide the



Pittsburgh Terminal Coal Corporation Gets New Cleaning Plant

During the first week of February the installation of a Sand Flotation Cleaning Plant, having a capacity of 10,000 tons daily, was completed at the Coverdale No. 8 mine, of the Pittsburgh Terminal Coal Corporation, in the Pittsburgh field.

The system was designed by T. M. Chance, consulting mining engineer, of Philadelphia, Pa., and was first placed in operation in the anthracite field more than 10 years ago, and during the intervening years millions of tons of anthra-

cite have been prepared by the Chance system.

It is understood that plans are already under way for the installation of another plant at the Powhatan mine, of Pittsburgh Terminal, at Powhatan Point, O.

While the plant at the Coverdale No. 8 mine is the first of its type in the Pittsburgh field, there is little question but that by the end of 1931 similar ones will be in operation in various sections of the bituminous field.

population with coal, is granted the Minister by the new decree.

The decree also provides that the managements of organizations engaged in the coal trade, when called upon by the Minister or his representatives, must present all documents, accounts, or other correspondence relating to their business. Findings of these inspections will be strictly confidential and in no case will they be permitted to be used by fiscal authorities, it is stated.

Monthly Coal Market Summary Appears in New Form

A "Monthly Coal Market Summary," the first issue of which has recently been issued by the Coal Division of the U. S. Bureau of Mines, replaces the former publication known as the "General Survey of Conditions in the Coal Industry," the last issue of which appeared in September, 1930.

The principle of the report is completely reversed. The new form contains a practically complete summary of statistical information relating directly or indirectly to the industry. It incorporates many suggestions made by operators and secretaries as to ways of improving the report. The Bureau of Mines invites further suggestions and criticisms.

Bibliography on Potash

The publication of Bulletin 327 "Potash Bibliography to 1928 (Annotated)," is announced by the Bureau of Mines.

The bulletin, which is by J. E. T. Berliner, is a review and compilation of technical literature on potash salts, including the aluminates, and their foreign occurrences.

The review is confined to the technical literature of the origin, history, and foreign occurrences of saline potassium minerals, their mining, description, treatment, and physical-chemical relations. The literature on alunite, jarosite, and related minerals has also been included.

SILVER REPORT

(From page 166)

change in January, 1931, said:

But more important than the "Rex" scheme for the rehabilitation of silver is the giving up by the Government of India of their policy of silver sales. * * * The Government of India has sold until now approximately 87,000,000 ounces of silver, * * * and it seems that the government policy is not yet revised. These sales of silver by the Government of India, and the world knowledge that a further large amount is for sale, have depressed the world market to the present low level.

The business week, as reported in the *Literary Digest*, describing the decline in silver:

One of the major economic curiosities of the age.

Dispatch from China, as reported by Boston News Bureau, states that the Chinese Government—

Faces commercial ruin from the tobogganing of silver prices.

Federal Reserve Board Bulletin of January, 1931, states:

The decline in the price of silver affected the trade of the silver-using countries of the Far East.

WITH THE MANUFACTURERS

Heisler Oil-Electric Locomotive

Exhaustive tests of a new type of oil-electric locomotive, recently made at Erie, Pa., indicate that the manufacturers of this class of equipment have heard the demand of the present age for more power and greater efficiency and have met it for a number of important commercial and industrial activities.

Briefly, the Heisler Locomotive Works, of Erie, has combined Diesel engines

he mentions a few of the construction features which accomplished that result. Chief of these details are the single drive shaft, running through the two motors to both front and rear trucks, also a gear ratio that makes possible the development of greater "useful horsepower."

Two 180-horsepower oil burning Buda Diesel engines furnish the power which drives two Westinghouse generators.

know the actual performance possibilities of the equipment, one of the few dynamometer cars in the country was obtained from the New York Central Railroad Company and coupled between the locomotive and a string of 15 hopper cars filled with coal. At the rear of this train a steam locomotive was attached for the purpose of increasing the load by setting the air brakes on the string of freight cars.

The dynamometer car is a special testing car which records accurately the power, speed, rate of acceleration and the useful horsepower developed by locomotives and it is manned by a crew of 13 specially trained electrical and mechanical engineers.

When the new oil-electric locomotive pulled its initial load and when that load was increased by the application of the air brakes, delicate instruments in the dynamometer car registered the actual effort being expended. When these readings were translated into draw-bar pull, it was found that the locomotive was pulling the equivalent of a train of about 80 loaded cars, according to Swabb and the Westinghouse engineers who witnessed the demonstrations.

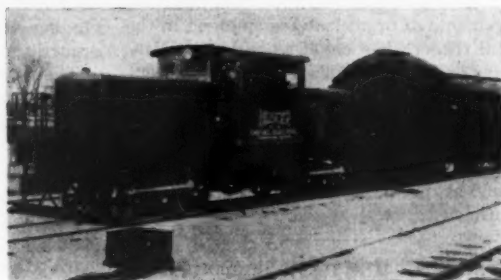
Tests were made on a straight level track, on a grade of 3 percent and around a 14-degree curve.

It is probable that the locomotive will be put into actual industrial and commercial use within the next few weeks to further demonstrate its practical value.



Left—Side view of the 60-ton Heisler oil electric locomotive with portions of the hoods removed to show the positions of the two Diesel engines. Generators are between the engines and the motors are directly beneath the center of the locomotive instead of in the usual positions over the axles

Right—The Heisler oil-electric locomotive and a portion of the dynamometer car in which were recorded the power, speed, acceleration rate and other details of its performance when tested on straight level track, on grades and sharp curves



with Westinghouse electrical equipment in such a way as to produce a new 60-ton, oil-electric locomotive that will pull a load equal to that of a 100-ton steam locomotive, indicating a draw-bar pull of 47,800 pounds, according to the crew of the dynamometer car in which the results were recorded.

Engineers point out that this is the power required for a steam locomotive to pull a train of about 80 loaded freight cars on a level track. An actual comparative test reported by Frank Swabb, an official of the Heisler Company, revealed that on a 3 percent grade and 14-degree curve the 60-ton locomotive pulled 149 percent more load than an 81-ton super-heated steam locomotive working under the same conditions of track and grade.

Mr. Swabb explains that the new locomotive was built specially to produce high power at switch yard speeds and

These, in turn, produce the current which drives the Westinghouse motors, the motors turn the shaft and the power is transmitted to the drive wheels through the axles.

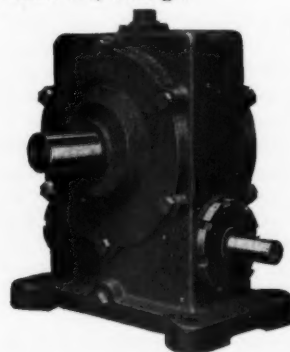
Engines and generators are above the frame or floor level of the locomotive and are direct connected. The motors are suspended to the frame, directly below the generators and midway between the two trucks. This is the first time any electric locomotive has been so constructed, the usual method being to place the motors directly over the axles.

Universal joints in the drive shaft, working in combination with the swivel trucks, make it possible for the locomotive to negotiate the sharpest of railroad curves safely, and the drive shaft practically eliminates the possibility of lost energy through slipping or spinning wheels, says Mr. Swabb.

To determine the actual figures and

Worm Gear Reducers for Small Electric Motor Drives

A series of three small worm gear speed reducers for small electric motor drives—up to 7 hp. capacity—have been developed by the W. A. Jones Foundry & Machine Co., Chicago.



These reducers are almost identical with the heavy duty Jones reducers except in size. The worm is made from a low carbon, nickel steel forging that is hardened to increase strength and wearing qualities and to provide for a low coefficient of friction. The wheel is made of a special nickel phosphor bronze alloy. The gear blank is dry sand cast and chilled, producing a casting of exceptional strength and load carrying capacity with a minimum of friction. The gear shaft—a high carbon steel forging—extends out on both sides of the housing so that machines can be driven from right or left hand side or both. A metal cap, or shaft guard, covers one shaft and is easily removed. Both the gear shaft and the worm shaft are mounted on Timken roller bearings.

Large stocks are kept in Chicago, Detroit, New York, Los Angeles and San Francisco, and immediate delivery of machines "ready for use" is now possible. Bulletin No. 49 gives complete information.

New Mine Hoist Pedestal

The General Electric Company announces a new design of pedestal for use with mine hoist equipment. The general design is that of a wrought pipe standard, supporting a panel tilted at an adjustable angle. The panel is made of formed $\frac{1}{4}$ -in. sheet steel and has provision for mounting on it, one or two instruments together with the pressure gauge. The panel is mounted by fastening it to a horizontal $1\frac{1}{4}$ -in. pipe (capped at both ends) by means of switchboard panel fittings. This pipe in turn is attached to the pedestal or standard by using half of a floor flange.

The standard itself is made by welding a length of $2\frac{1}{2}$ -in. pipe to a floor plate, thus making a neat and sturdy looking support for the panel. The length of the pipe determines the height of the panel. The whole pedestal and panel is finished with a coat of Glyptal lacquer, thus presenting a pleasing appearance.

While this particular pedestal was designed for mine service, it is not confined to use in that field alone, but can be used wherever a support is needed for one, two, three, or even four instruments, with perhaps an indicating lamp or two.

Switch For Changeable-Pole Motors

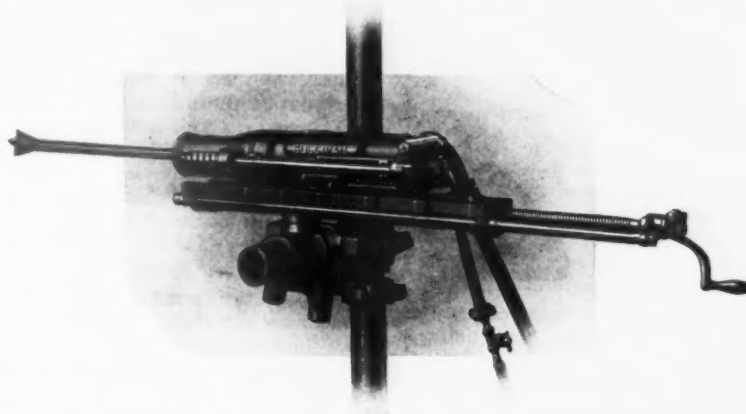
The General Electric Company announces two new switches for use with multi-speed, changeable-pole motors. These bear the designations CR-2960-SY-108 and SY-113, the first being for use with smaller and the second for larger sizes of motors. These switches, when used with multi-speed, squirrel-

New Sullivan Drifters

Sullivan Machinery Company has announced a new series of entirely new rock drills for mines, quarries, and construction service, designed for use on columns, or bars, or drill carriages for tunneling or development work, or on

water inlet at the rear or side of back-head, as preferred, hole blower with independent control, front offset or centrally located shell trunnion.

The above drills are described in a preliminary bulletin 87-F, which will be sent upon request.



tripods or quarry bars for general outdoor drilling.

These machines include the following: "T-7" 3-in. cylinder, 122 lbs. for holes to 15 ft.; "T-6" $3\frac{1}{2}$ -in. cylinder, 159 lbs. for holes to 20 ft.; "T-5" 4-in. cylinder, 190 lbs. for holes to 30 ft. and up.

Features of the new drifters, which are uniform in design, include smooth outline and absence of projections, securing maximum convenience in drilling top or bottom holes from a column arm or bar; and in handling steel over the drill, new chuck design for shankles or lugged steel,

A spring mounted handle is available for the "T-6" and "T-7" drifters, when the drill is to be hand held and used as a sinker, instead of being mounted in a shell. The machine is readily converted from a mounted to a hand drill by simply removing the shell and feed screw parts and substituting the handle unit in their places. This device greatly reduces the shock and jar of drilling with these large machines, enabling the runner to handle them in continued service without undue fatigue.

cage induction motors permit obtaining different speeds by changing the polar grouping of the stator coils.

For small motors one of these switches will serve as a starting switch as well as a pole-changing switch. In such cases some form of under-voltage protection is recommended between speed points, such as is provided by most magnetic starting switches. The new switches can be used with two-, three-, or four-speed motors for constant-horsepower or constant-torque service without change in mechanical construction.

New Volume on Rock Tunnel Methods

Summarizing the experience of a large number of leading tunnel builders, "Rock Tunnel Methods" is a volume just published by the Hercules Powder Company. The symposium of tunnel methods was compiled by Theodore Marvin, editor of *The Explosives Engineer*, assisted by Douglas C. Corner, president, St. Louis Power Shovel Co.

The new volume covers the drilling,

blasting, excavating, transportation, and ventilation methods on 31 important tunnels located in this and other countries. Certain data on tunnel lining also have been included. Among the tunnels described are the Boston Water Supply Tunnel, Moffat Tunnel, Coast Range Hetch-Hetchy Tunnel, the New Cascade Tunnel, the Owyhee Tunnel, St. Paul Pass Tunnel, and the Shimizu Tunnel, Japan. The tunnels described are for railroad, mine, water supply, and hydro-electric purposes.

The volume is well indexed and provides easy access to any form of data on tunnel building. An article on "Delay Electric Blasting Caps in Tunnel Driving," and some of the recommendations of The Institute of Makers of Explosives are included.

"Drilling and Blasting in Some American Metal Mines," by the same author, has found a wide demand among tunnel contractors and engineers and can be used to advantage in conjunction with "Rock Tunnel Methods." Both books can be obtained by writing to the Hercules Powder Company, Wilmington, Del.

1931 Link-Belt "Grizzly" Crawler Loader Announced

Continuing a policy of constant study and improvement of their line of portable loading equipment, Link-Belt Company announce the 1931 model Grizzly Crawler loader, fully described in folder No. 1256, just published.

The 1931 Grizzly has the improved helical ribbon type feeder, announced in 1930, with its cast steel spiral which digs, lifts and conveys the material to the bucket, cutting a 7-ft. 7-in. wide swath in the material handled.

The power plant of the Grizzly is a simple, compact power unit, consisting of a 30-hp. Buda gasoline engine, equipped with a governor to regulate the speed automatically, or a 20-hp. electric motor of standard specifications.

The elevator has a rated capacity of 1½ cu. yds. per minute, with uniform feed, based on sand, stone and gravel, 1½ in. and smaller; run-of-mine bituminous coal or coke, etc.

A three-speed transmission gives the crawlers a speed of 30 ft. per minute, or 66 ft. per minute, in the digging direction, and 27 ft. per minute in reverse.

New Oil Leak Proof Vertical Worm Reducer

Although most modern speed reducers are fairly free from oil leakage, the problem of positive elimination of leakage on slow-speed shafts of vertical reducers has always been a more or less difficult one. Foote Bros. Gear and Machine Company announce a new, vertical, leakproof "Hygrade" worm gear reducer line, designed for use in plants wherever the slightest leakage of oil will contaminate and damage the product. The company states that exhaustive tests have thoroughly demonstrated its positive leakproof qualities. The leakproof feature is incorporated in any of the units manufactured by this company. Complete information and data is available by writing to Foote Bros. Gear and Machine Company, 111 North Canal Street, Chicago.

New Push Button Control for Floor Operated Cranes

The General Electric Company announces a new pendant type push button for controlling small floor operated cranes. This is designed to supersede the present rope and chain types of control, with the advantages of greater safety to the operator, a saving in time (only one man being necessary to operate the crane) and less aisle space required on the factory floor.

The push button station is 20¼ in.

long, 2¾ in. wide and 29/16 in. deep, less the projection of the buttons. It is of the proper size to be readily grasped and operated by one hand. The box is cast aluminum.

Circular Covers Dry-Type Transformers and Autotransformers

A new, 12-page, illustrated circular, covering Dry-Type Transformers and Autotransformers, is announced by the Westinghouse Electric and Manufacturing Company. This booklet, which is identified as Circular 1886, contains, in addition to descriptions of the application, operation, and construction of the various transformers, tables giving their ratings, style numbers, weights, and dimensions.

Because of their small size, these transformers are especially applicable where space limitations or insurance regulations prohibit the use of oil-insulated apparatus.

T. R. Akin Heads Mancha Co.

Thomas R. Akin, president of the Laclede Steel Company, St. Louis, Mo., has been elected president of the Mancha Storage Battery Locomotive Company, St. Louis, Mo., succeeding Mr. Raymond Mancha, who died January 3, 1931.

The other officers of the company will remain unchanged, and the business will be conducted along the same lines as in the past.

The General Electric Company, of Schenectady, N. Y., has disposed of its trolley line material business to the Ohio Brass Company, of Mansfield, Ohio. This includes overhead materials for electric railways, electrified mines, industrial haulage, and electrified steam roads.

This is a field in which the Ohio Brass Company has specialized quite intensively for many years. This transaction is relatively of small importance because of the volume of business involved, and, although of some advantage to both companies, it is principally of benefit to the users of this class of material.

Metal ore, lumber and coal in widely scattered parts of the world are to be moved by three locomotives recently sold by the Westinghouse Electric and Manufacturing Company.

One is an 8,000-pound chassis storage battery locomotive, sold to the Sydney Thompson Company, of Johannesburg, South Africa, for use in the metal mines of that territory. This unit makes the eighteenth such locomotive in the company's fleet.

Another is of the storage battery, lumber mill type, and goes to the White River Lumber Company, Enumclaw, Wash. The third is a 6-ton, gathering locomotive for the North East Coal Company, Auxier, Ky.

Mt. Vernon Car Mfg. Co., manufacturers of freight cars, have appointed W. W. Baker, of Pana, Ill., as their representative in the central Illinois field to represent them on mine cars, mine car wheels, pit car loaders, miscellaneous forgings and castings. The Industrial Supply Company, Brown Marx Building, Birmingham, Ala., will represent the company in the same capacity in the Birmingham district.

RandS Official Returns from Russia

Colonel Warren R. Roberts, chairman of Roberts and Schaefer Company, Chicago, has returned to the United States after an extended business trip in Europe which included a nine months' stay in the U. S. S. R.

Fuller-Kinyon System

A new catalog No. 903, describing the construction and application of the Fuller-Kinyon System to the transportation and distribution of pulverized coal, has just been issued by the Fuller Lehigh Co., 85 Liberty Street, New York, N. Y. Besides including a general description and a diagrammatic sketch of the system, the catalog contains a number of illustrations of the equipment and views of installations. Copies of the catalog are available upon request to the company.

New Line of Lathes Announced

The R. K. LeBlond Machine Tool Company, Cincinnati, Ohio, well-known maker of machine tools for the industrial field, has recently placed on the market a new line of lathes, designated the "Regal." This new lathe is an exact counterpart of the larger regular line of the LeBlond engine lathes and is designed especially for use in general service shops, garages, experimental laboratories, and other places where light manufacturing is done. It is built in five sizes ranging from 10" to 18", and has an 8-speed selective geared headstock, using heat-treated, normalized and hardened steel cluster gears. The final drive from the intermediate shaft to the spindle is through helical type gears. The head is driven by a self-contained motor located in the rear of the head on the upper part of the leg with multiple V belt drive.

Unravel those coal problems at Cincinnati

AN outside slant at your problems will be helpful. Others are solving questions similar to yours, and you can learn about them at the Annual Coal Convention of The American Mining Congress. This great get-together of coal operators is the best opportunity of the year for comparative study of all that is new and progressive in coal mining. Rapid strides are being made in many of its phases.

The timely convention program covers new developments through papers grouped under such general subjects as mining systems—mechanical mining—safe operating practice—scientific organization—maintenance and transportation—fuel utilization. New production methods and new refinements in practice and equipment that are of consequence to all coal men will be described and exhibited at Cincinnati. Wait until you have been there before making any important decision. Many operators find that the shortest route to profit lies through the annual Cincinnati meeting. Progress is made at this Convention—plan now to come. Write for a preliminary program and information about reduced railroad fares. The American Mining Congress, 841 Munsey Bldg., Washington, D. C.



BOTH Convention and Exposition will be described fully in the May issue of the Mining Congress Journal. The "Pictorial Exposition," a valuable advertising section featuring the best in coal mining equipment, is a part of this, the official Convention Number. The papers presented at the convention are copyrighted and will appear in the Convention Proceedings Number, published in July. If you want extra copies of one or both of these two important coal issues, let us have your order early.

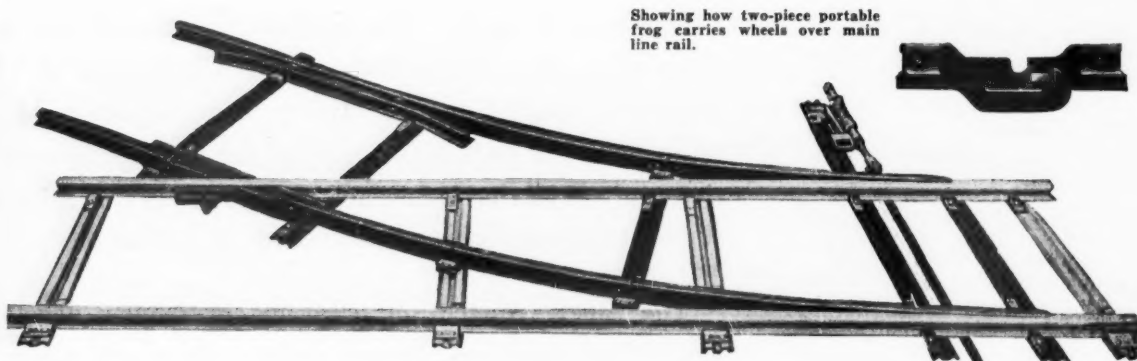
**Eight Annual Coal Convention
and Exposition of the
American Mining Congress**
CINCINNATI, OHIO, MAY 11-15, 1931



Bring your troubles to Cincinnati—perhaps you can leave them there.

QUICKLY LAID WITHOUT CUTTING TRACK

Quickly laid without disturbing main track this turnout makes it easy to serve the mechanical loader with empty cars. It is used for open end sidings, complete passing sidings or temporary turnouts with equal success and economy of time and track. Carries cars over main track—main line traffic is undisturbed. Send for special descriptive literature or for Catalog "C" explaining its simple operation in detail.



Showing how two-piece portable frog carries wheels over main line rail.



THE WEST VIRGINIA
RAIL COMPANY, HUNTINGTON, W. VA.



THIS self contained unit offers complete control of car movement without the use of many customary devices and duties. Heavy duty—easy control—quick installation—in-expensive.

HOLMES CAR RETARDERS

The advantages and easy operation of this electric car retarder are fully described in Bulletin 62. Other HOLMES equipment includes Coal Lowering Spirals, Sheaves, Cages, Loading Booms, Hoists, and Complete Tipples.

Write for information

ROBT. HOLMES & BROS., INC.
DANVILLE, ILLINOIS

Send for
Bulletin
No. 62

Cutting the

RECENTLY at a mine at Vandergrift, Penna., Robinson engineers designed and installed a new fan in an old fan setting and changed the volume of air from 58,000 C.F.M. at

POWER BILL

1.6" W.G. to 78,000 C.F.M. at 2.25" W.G. and are using only one 40 H.P. motor where two 40 H.P. motors were formerly required to drive the fan.

Write for details

in half
and making a profit

ROBINSON VENTILATING CO.

ZELIENOPLE - PENNSYLVANIA

AMERICAN STEEL & WIRE COMPANY WIRE ROPE



SO important is wire rope to industry—on excavating machines—on hoists—on elevators—and for a thousand and one purposes—that its users can afford only to specify a brand of proved dependability, economy and long life. Because of its outstanding records—and the known reliability of its maker—American Steel & Wire Company American Wire Rope will be found on most equipment where service requirements are severe.

*Made by the Largest Wire
Rope Manufacturer in the World*

The illustration shows American Wire Rope in use on the world's largest electric shovel.

1831



1931

AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

208 South La Salle Street, Chicago

And All Principal Cities

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco

Export Distributors: United States Steel Products Company, New York

This Picture Tells All



Actual, unretouched photograph of prominent Pennsylvania coal mine, showing 4" line of cement-lined Simplex cast iron pipe.

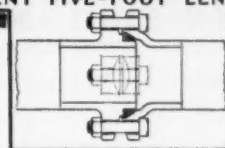
THE photograph is the best recommendation for Simplex Cast Iron Pipe we could possibly cite. It was made on November 5, 1930, at which time this particular line had been in service THREE YEARS. The record speaks for itself. It bears witness to our claims that Simplex Pipe outlives ordinary black pipe many times over. And the beauty about Simplex Pipe is that it fits into existing lines—enabling you to replace inferior lengths (as they wear out) with Simplex, thus eventually securing a permanent line. Write our Birmingham or Pittsburgh office for free illustrated catalog, prices, etc.

SIMPLEX

CAST IRON PIPE

IN CONVENIENT FIVE-FOOT LENGTHS

WITH THE FAMOUS
SIMPLEX
JOINT



813-C.

AMERICAN CAST IRON PIPE COMPANY

BIRMINGHAM, ALA.

and 1222 Empire Bldg., Pittsburgh, Pa.

CONNELLSVILLE



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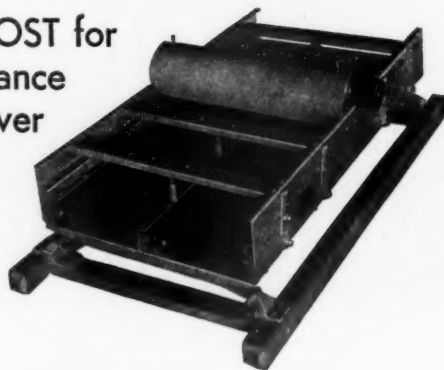
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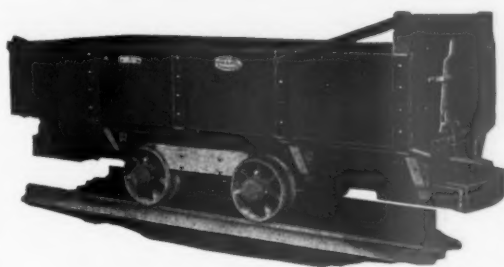
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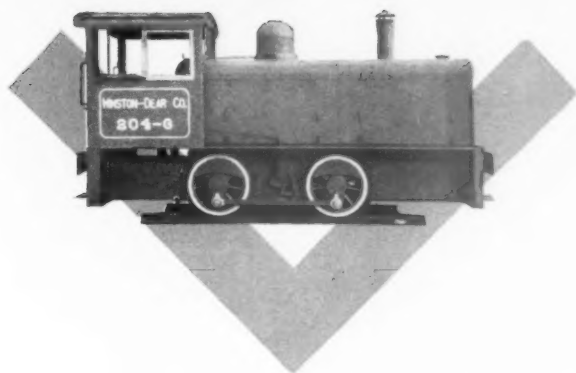
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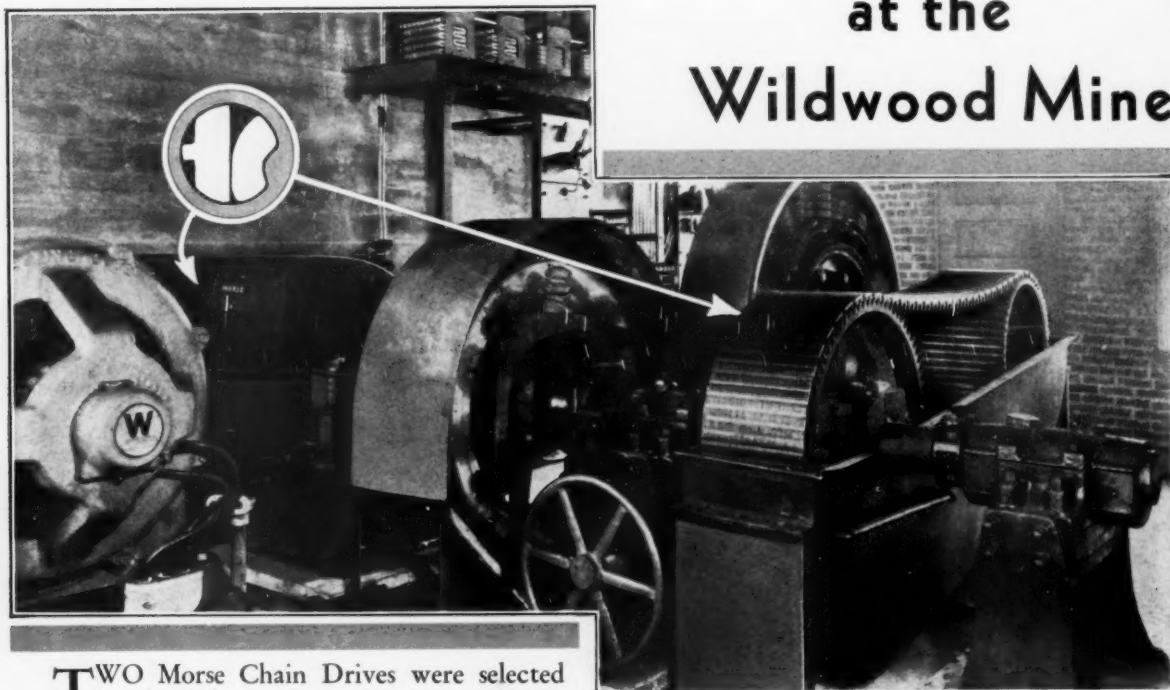
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